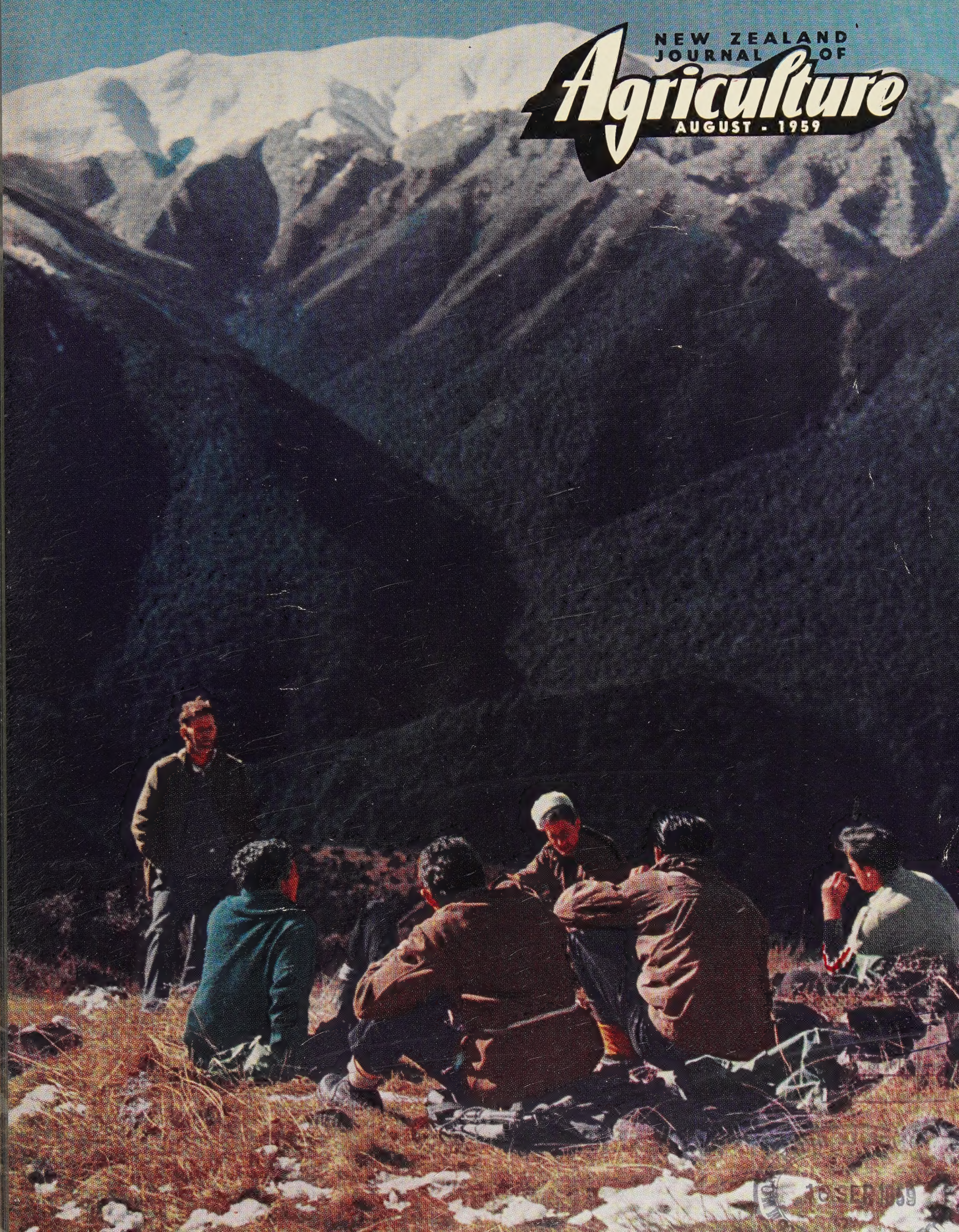

NEW ZEALAND JOURNAL OF Agriculture

AUGUST - 1959

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Agriculture

[*J. H. Johns*

Young hunter trainees of the New Zealand Forest Service at "school" at Golden Downs, Nelson, are shown on this month's cover. They are learning about the control of noxious animals, which is an important aspect of conservation of protection forests. This in turn has far-reaching effects on farm lands. The officers are on Beeby's Ridge with, in the background, Gordon's Knob, snowclad and covered in native protection forest. This mountainous area is the watershed of the Motueka River.

CONTENTS

Ruakura Farmers' Conference Week		98
Recent Research Work: Trials with Thiram as Seed and Ripening Grain Protectant		103
Successful Culture of Fodder Beet	D. J. G. Davies	104
Runner Development of Redgauntlet Strawberry Plants Stimulated by Cool Storage	K. C. Hockey	104
Keeping the Dairy Herd Healthy	T. Wallace	105
Dairy Produce Graded for Export		112
Phenothiazine Wool Stain	J. E. Duncan	113
Spurrey Control in Brassica Crops	R. C. Stephen	115
Manuka Blight Losing Effectiveness in North Island	C. J. Hamblyn	119
Care of Livestock during September		124
Fodder Crop Production (Seasonal Notes)		125
Dwarf Apple Trees	G. F. Thiele	127
High-energy Poultry Mashes Give Better Returns than Cheaper Mixtures	J. Edmondson	135
Arrangement of Tile Drainpipes to Divert Spring into Drainage System	K. L. Mayo	138
Farm Dairy Instruction Service	M. J. McFetridge	139
Meteorological Records for June		140
How to Rear Calves on Milk Substitutes	I. L. Campbell	141
Crop Production: Blue Lupins	C. P. Whatman	147
Radio Broadcasts for Farmers		151
Feeding Concentrates to Milking Cows	G. R. Moss	153
Safety Rules for Use of Explosives		159
The Home Orchard in Spring	D. W. McCallum	161
Preservation of Timber by Painting	R. M. Sinclair	165
Dangers to Young Stock in Unusually Hot, Dry Weather	D. H. Le Souef	171
The Home Garden	A. G. Kennelly	173
Roasting Meat	Maud B. Strain	179
The Flower Garden:		
Garden Walls	K. H. Marcussen	183
Work for September	Rosalie A. Campion	187
Small Boy's Cardigan		191

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RUAKURA PRESENTS—

The Annual Review

RUAKURA FARMERS' CONFERENCE WEEK

was presented at Hamilton in June for the eleventh successive year and for the second year in Ruakura's own theatre, with Dr C. P. McMeekan in the leading role and a distinguished supporting cast. It played, to almost capacity houses, three full-day sessions of papers and discussions; three night lectures (two illustrated); a field day at the Ruakura Animal Research Station, and a matinee at the associated Hill Country Station at Whatawhata.

IS it levity to regard the Ruakura conference as, at least in part, entertainment? In his development of the conference and field days over the past 10 years Dr McMeekan, Superintendent at Ruakura, fits snugly into the role of impresario. He has used many of the artifices of the theatre to draw and hold what are consistently much larger audiences of farmers than attend any other comparable functions at which extension fare in agriculture is dispensed.

—ITS RESULTS

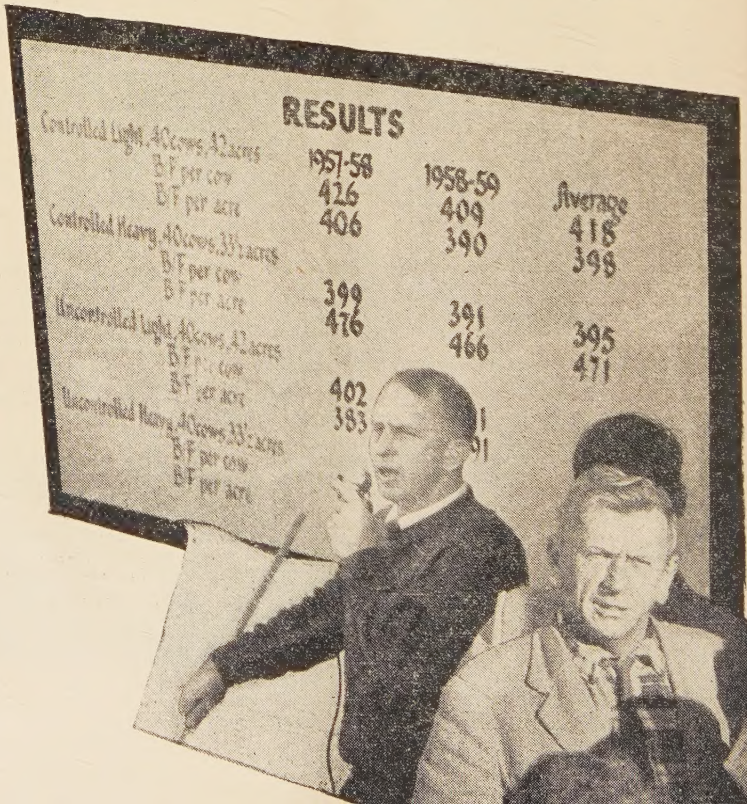
FOR the presentation of formal papers he has depended solidly on his own staff, but has ranged widely afield for "name" players for authoritative and sometimes controversial roles. He has consistently over the years captured and held a wide audience with a variety of characterisations. One remembers particularly his impassioned attack in 1955 on the critics of Ruakura's facial eczema research; his castigation of New Zealand farmers, on his return from an overseas visit, as "lazy, complacent devils", and his impish softening of the blow by his declaration that there were no other farmers with whom he would rather work. There is a touch of the dramatic in his serialisation over the years, from conference to conference, of some of the more controversial issues such as the influence of controlled versus uncontrolled grazing on butterfat production.

Attendances at conference sessions (the two-year-old Ruakura Conference Hall with accommodation for 1,000 was regularly almost full this year) and at the field days (about 6,000 this year) leave little room for doubt about the acceptability of the type of extension information provided. The level at which discussion of papers is conducted and the appreciation of the significance of more technical aspects of research work demonstrated at field days reflect the cumulative influence of Ruakura in stimulating a wider understanding of the complexities of the business of livestock farming.

Broader Educational Basis

The difficulty of Ruakura itself producing enough new work in animal research developments every year to provide a full programme of papers and field day demonstrations was referred to by Dr McMeekan in opening this year's conference. His staff were "retiring more and more into their back rooms" and it might be necessary in future to formulate a programme on a broader educational basis than it has had or could have under the present circumstances at the Station.

"The New Zealand Institute of Meat Research is to be located here and when next we meet it is hoped that the institute's laboratory block will be in use. The Department of Agriculture has decided to locate the main laboratory and experimental area of the Rukuhia Soil Research Station at Ruakura, which will mean that



Ruakura will become a very much broader research organisation. There is a possibility that the proposed university for South Auckland will be located here, which would still further reinforce scientific strength and scientific performance."

FIELD DAY

BUSES circulating continuously round 11 demonstration points on the Station and the New Zealand Dairy Board's Artificial Breeding Station at Newstead near Ruakura enabled about 6,000 visitors during the field day to see some of the Station's efforts to make farming more productive and more profitable.

All points were manned by staff associated with the work, who had a full day's discussion with the ever-changing groups that came to admire, criticise, or inquire.

In 10 years' experience with field days Ruakura's superintendent and staff have evolved many adaptations from the first efforts of a loudspeaker vehicle perambulating from point to point with the crowd streaming after it, to the present highly organised circuit of static demonstrations linked by a continuous bus service.

A departure this year from the somewhat regimented set address at each point at regular intervals was a less formal "talking point" type of display with informal discussion of the work in progress. "Farm walks" over some of the self-contained research units within the Station were also a popular innovation.

Facial Eczema Research

Since the major advance in facial eczema research with the discovery last year of the fungus *Sporidesmium bakeri* as a toxic agent, it has been possible to concentrate further work in a more definite direction and for other research organisations to undertake specialised sections of it. The present position was illustrated with photographs and diagrams of the ramifications of the search for further light on what remains a very complex problem. Aspects illustrated and discussed by workers associated with the investigations were: The fungus and its discovery; its growth at the base of pasture plants and conditions favouring its growth; experimental animals showing lesions induced by feeding them cultured spore material; attempts to isolate the toxin and determine its chemical composition; the preparation of large amounts of fungus and extracts for chemical and analytical work; studies of the course of the disease in animals to seek methods of counteracting it; the trial of more sensitive methods of detecting toxicity of pasture; field experiments with fungicides and other control methods; and integrated work with other laboratories of the Department of Agriculture, the Department of Scientific and Industrial Research, and the Meteorological Service.

Farm Water Supplies

Maps and diagrams showing sources and quality of ground water related to the geology of the Waikato were of considerable interest to local farmers faced with water problems in drought periods, for dairy shed hygiene, and for irrigation needs.

Vaccination in Animal Husbandry

Based on the assertion that £5 spent on an adequate vaccination programme can save £50 in a 1,000-ewe flock, a demonstration at the Ruakura Woolshed showed when and how to vaccinate ewes and lambs against a number of diseases that represent a continuous drain on farm economy. The vaccination of cattle and dogs and drenching against worms in cattle, sheep, and pigs were shown to be important factors in the keeping down of costs of production represented in livestock losses and inefficiency.

Papers and Speakers

Costs and Profits of Beef Production on Fat Lamb Country	**N. A. Clarke**
Achieving Health and High Calving Percentage in Hill Country Cattle	**E. D. Fielden**
Further Studies with Hexoestrol for Beef Production	**G. C. Everitt**
Lamb and Beef Production under Different Stocking Systems	**D. E. K. Walker**
Mixed Age Versus Cast-for-age Ewes in Fat Lamb Production	**C. P. Tebb**
Selenium and Animal Health	**C. Drake, A. B. Grant, and W. J. Hartley**
Electric Fencing on Hill Country	**E. A. Clarke and R. G. Umbers**
Cereal Growing in the Waikato	**I. L. Elliott**
Fungi Affecting Pastures, Crops, and Animals	**I. D. Blair**
Farm Budgeting to Increase Profits	**W. O. McCarthy**
New Zealand Type Mucosal Disease	**R. M. Salisbury**
Further Studies on the Usage of Phosphates	**J. Karlovsky**
Proteins and Life	**R. L. M. Synge**
The Rearing of Calves on Milk Substitutes	**I. L. Campbell**
Keeping the Dairy Herd Healthy	**T. Wallace**
Factors Affecting the Efficiency of Conversion of Pasture to Butterfat	**C. P. McMeekan**
Developments in Herd Improvement Methods Overseas	**A. Stewart**
The Relationship of Inheritance and Environment to Herd Production	**P. J. Brumby**
Management Factors Associated with High- and Low-producing Herds	**J. D. J. Scott and D. S. M. Phillips**

Improving the Wool Clip

Displays at the Ruakura Woolshed have been a barometer in recent years of the increasing interest in sheep in the Waikato. Papers for sheep farmers on the first day of the conference have in recent years drawn ever increasing crowds until they are now almost as well attended as the sessions for dairy farmers. There has been similar increasing interest in the field day demonstrations of techniques of producing better quality meat and wool.

A display of practices that raise and lower returns from wool, based on the premise that preparation of the clip starts long before work in the shed, drew attention that crowded the woolshed uncomfortably throughout the field day. Flock management aimed at attaining the wool buyer's requirements of count, length, strength, and evenness was shown to depend primarily on culling of flock ewes and hoggets on wool weight, breeding, and good feeding.

Winter Management of Ewes

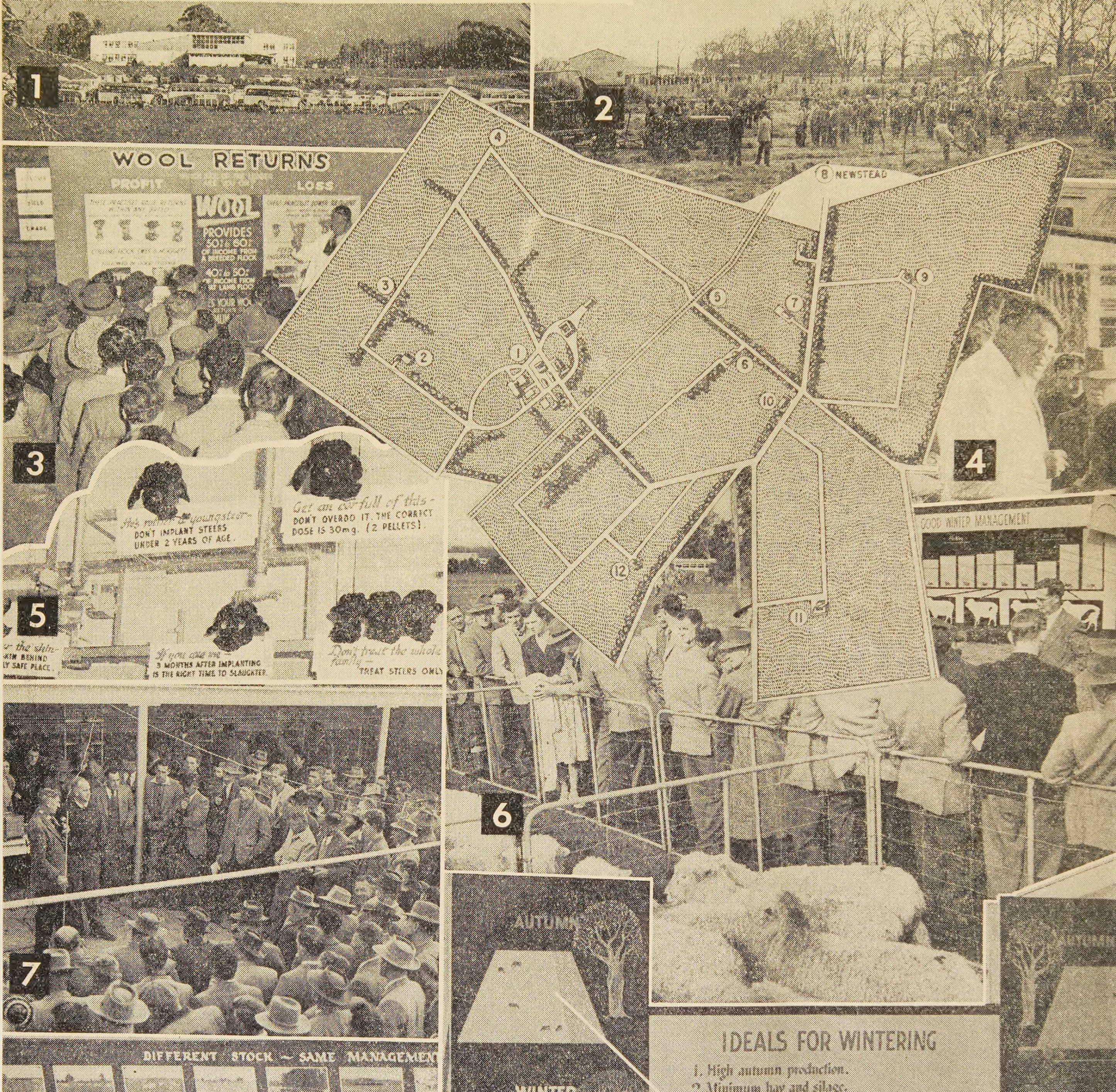
The nutritional requirements of the breeding ewe are being studied on a self-contained Ruakura farmlet of 50 acres of consolidated peat subdivided into 17 3-acre paddocks. Theme of the field day demonstration here was that winter is the critical time in management of the ewe flock. There are periods when it is important to feed the ewe well and others when it is not so important. The work has shown that if the rams are put out on 1 March, after a month 80 per cent of the ewes are in lamb and there is no point in going on with flushing. Feeding can be tightened up and the surplus growth saved for winter feeding. During the first three or four months of pregnancy the rate of development of the lamb is slow and demands on the ewe correspondingly less, but in the last four to six weeks the lamb grows very rapidly and it is important to keep the ewe on a high level of nutrition. Efficient management entails intelligent relating of the ewe's nutritional requirements to pasture production with the aim of maximum production of meat, wool, and lamb.

Animals and pastures used in the project were inspected and discussed with Ruakura workers during a farm walk over part of the unit.

Meat Production

Recent market trends have quickened interest in beef production. Meat production per acre has been investigated for the last 10 years on 150 acres of the fat lamb farm at Ruakura divided into three 50-acre units stocked under different systems with sheep and cattle. A paper summarising results on the completion of the third three-year stage of the work (to

Field Day at Ruakura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WOOL RETURNS
PROFIT
LOSS
WOOL PROVIDES
NEWSTEAD
Get an ear full of this –
DON'T OVERDO IT. THE CORRECT DOSE IS 30mg. (2 PELLETS).
DON'T IMPLANT STEERS UNDER 2 YEARS OF AGE.
3 MONTHS AFTER IMPLANTING IS THE RIGHT TIME TO SLAUGHTER.
Don't treat the whole family –
TREAT STEERS ONLY
GOOD WINTER MANAGEMENT
AUTUMN
WINTER
IDEALS FOR WINTERING
1. High autumn production.
2. Minimum hay and silage.
3. Cattle in good condition at calving.
4. Ample nutritious feed available after calving.
5. Minimum pasture damage.
6. Suitable distribution of fa

DIFFERENT STOCK – SAME MANAGEMENT
9

Inset above: Guide map to demonstration points, some of which illustrated are: 1—New conference hall and laboratory block. 2—Silage making equipment. 3—Preparation of the wool clip. 4—D. M. Smith at Pig Centre. 5—Hexoestrol implantation in beef production. 6—J. C. Gerring discussing winter management of the ewe flock. 7—Dr McMeekan and J. W. Keir keenly discussing with a large crowd the stocking rate and grazing management experiments at No. 2 Dairy. 8—Dr L. R. Wallace discussing research into wintering of the dairy herd. 9—Miss D. E. K. Walker discussing the projects investigating meat production at different rates of stocking with sheep and cattle.

be published in a later issue of the "Journal") was presented by Miss D. E. K. Walker, who concluded that in future some diversion from fat lamb farming to beef production might be nationally desirable and privately profitable, and that the change-over could be achieved without lowering output of meat.

The field day demonstration at this unit showed how to attain the objective of putting off 12 chillers every three months from 150 acres carrying 600 ewes, with 24 spring weaners and 24 autumn weaners bought in every year.

Milking Techniques

Investigation of the effect of shed management on butterfat production entails detailed measurement of the milking process and factors that influence it. A multiplicity of instruments, most of them evolved or adapted at Ruakura, furnish the factual basis on which recommendations for shed techniques are based.

The milking curve of every cow in a herd of 60 is recorded at every milking. Shed models illustrated the advantages and disadvantages of different types of sheds and milking techniques.

Papers at the conference and the production records of Ruakura herds point to the important influence of workers in the shed and of milking procedures on levels of butterfat production. The mass of data coming from the work is helping to put a measure on many of the factors affecting the economics of dairy farming.

Pig Research and Production

Nutritional studies, early weaning investigations, and farrowing and fattening accommodation developments that have been featured at the Pig Centre at earlier conferences are obviously bearing fruit in a changing attitude to pig husbandry. Economic factors associated with lower prices for dairy produce in recent seasons may also have a bearing on the evident increasing awareness of the importance of the cost factors of efficient food utilisation and more regard for the health and comfort of stock. Questions and discussion with staff at the centre on the field day indicated that a high proportion was actuated by problems arising in the natural course of attempts by pig producers to apply a higher plane of management. Obviously the pig is becoming more widely regarded as a worthwhile paying guest and less as a necessary evil in the economy of dairy farms.

Artificial Breeding

After early research work on artificial breeding under Dr J. P. James at Ruakura a service was established on a commercial scale by the New Zealand Dairy Board and under Dr James's supervision at the neighbouring centre at Newstead. The centre has since been included in the Ruakura field day circuits, and growth in interest in it has paralleled the phenomenal rise in growth of the service. From the 3,600 cows mated in 1950, figures have soared to 320,000 in 1958. Improvement in genetic merit effected by A.B. is apparent in figures displayed at the field day demonstration: 12,500 tested A.B. cows outproduced home-bred cows in the same herds by 20 lb of butterfat per cow.

Static displays showed techniques and organisation of the service, and selected bulls attracted lively interest.

Grazing Management of Dairy Cows

Possibly no other research activity at Ruakura has provoked more interest and discussion than the lifetime production experiment at No. 2 Dairy, current now for 15 years.

Criticism of it by visitors to the International Grassland Congress in New Zealand in 1956 was followed by modification of its design to study over the past two seasons the interaction between grazing method (controlled versus uncontrolled) and stocking rate (high versus low).

The experiment involves four groups of 40 cows each on four farmlets totalling 151 acres under controlled grazing with light and heavy stocking and uncontrolled grazing with light and heavy stocking. Overall average production has been 400 lb of butterfat per cow and 422 lb of butterfat per acre on a surveyed "grass" area and "at the pail" basis.

Per cow yield has been higher under controlled than under uncontrolled grazing and higher under a low than under a high stocking rate.

Per acre yield has been greater under controlled than under uncontrolled grazing, but substantially lower under low than under high stocking rates.

A large crowd discussed results of the work with Dr McMeekan throughout the field day and after his paper (to be published in a later issue of the "Journal") on the last day of the conference.

"Proceedings" of Conference

PAPERS and a resume of discussions on them are printed in the conference "Proceedings", copies of which are supplied to those paying conference fees. Orders from those unable to attend the conference will be accepted up to the time of going to press in a month or so. They may be sent with the cost of copies ordered (10s. per copy, post free) to the Publications Section, Department of Agriculture, Box 2298, Wellington, or the Ruakura Animal Research Station, Private Bag, Hamilton.

Hexoestrol in Beef Production

The field day demonstration in the abattoir showed methods of implantation and carcasses of treated animals. A paper on the experiments will be published in a later issue of the "Journal".

Wintering the Dairy Herd

Ruakura recommendations for wintering dairy cows, based on experience at the Nutrition Centre over a number of years, have been that if hay and silage are fed liberally during the autumn when pasture growth is good, enough pasture can be saved in most years to provide an all-grass diet from about mid June. The cows are then in good condition at calving, when there is ample nutritious feed available. Avoidance of the feeding out of supplements in the winter minimises pasture damage and eases the burden of farm work.

To see if herd production is affected by this method compared with the more usual one of feeding the bulk of the supplementary feed after mid

High Order of A.B. and Herd Improvement in N.Z.

"THE two countries which are making best use of artificial breeding in raising the genetic merit so far as efficiency of production is concerned are England and New Zealand. . . . Only in these two countries have A.B. organisations with national coverage used bulls selected by as accurate measures as are available and selected with the emphasis on efficiency of production. In both these countries, too, A.B. and herd recording are considered complementary to the extent that the A.B. movement pays for information yielded by recorded herds so that A.B. can fulfil its obligation to get cows in calf to superior sires. . . .

"Without being in any way smug, or without encouraging any form of complacency, I feel that the New Zealand dairy farmer can consider that herd improvement in this country is proceeding as fast as, if not faster than, in overseas countries."—**Dr A. STEWART, Principal, Massey Agricultural College, in a paper to the Ruakura Farmers' Conference.**

June, a trial with two herds of 20 identical twins each run on 20 acres under the different systems is in progress. Results to date indicate that production differences will be small.

Inheritance v. Environment in Herd Production

Data and procedure in experiments with identical twins exchanged between Ruakura and low- and high-producing farms in an endeavour to measure the effects of heredity compared with feeding and management were shown in the field day demonstration. A paper on the work presented to the conference will be published in the next issue of the "Journal". Conclusions demonstrated were that high average production in a herd usually indicates good feeding and management rather than breeding; that genetic differences between herds, except in butterfat test, are generally small; and that the best simple guide to breeding value is the difference between an individual cow's yield and the herd average.

Impact on Production

At a time when there has been some questioning of the value of farmers' conferences on the scale of Ruakura's, and after 10 years' evolution to this conference's present scope and form, it may be appropriate to try to assess the part Ruakura plays in bridging the gap between research and the application of its findings in farm practice.

Only if Ruakura could develop techniques to measure farmers' responses as accurately as it does those of its research animals, and to trace percolation of its recommendations out to farmers through the increasing number of extension personnel who regard Ruakura as an annual refresher course, could anything other than an opinion be ventured.

But that results are not inconsiderable must be indicated by the widespread broadening of the approach of Ruakura visitors to their problems; the heightened level of their capacity to discuss a wide range of the complexities of scientific farming; and, in spite of Ruakura's disappointment at the wide disparity between the Station's production achievements and those on farms, the continuing general improvement in primary production.

The broadening educational basis of the programme forecast by Dr McMeekan and the likely expansion of scientific activities based on Ruakura indicate that the Station will continue to be a profitable venue for farmers' conferences.

Insect Pests of Seedling Brassica Crops

EVERY year in New Zealand there are hundreds of cases of apparent germination failure in turnip, swede, and chou moellier crops. Careful examination will show that in most of these the seed has germinated well enough, only to be eaten almost immediately by the very small *Collembola* or springtail.

This springtail, which is widespread in the Auckland Province, is a light brown insect less than 1/16 in. long that lives on the ground and springs over the surface, moving 4 to 6 in. with each hop. It eats the two smooth cotyledons or seed leaves of germinating brassicas and can destroy a crop in this early seedling stage.

While such a crop is being sown, therefore, the area should be examined for springtails, and if they are present, they can easily be controlled by spraying or dusting within three to four days with one of the following compounds: 1⅓ pints of 15 per cent dieldrin per acre, ½ lb of 50 per cent dieldrin powder per acre, ½ lb of 100 per cent lindane powder per acre, 2 pints of 20 per cent lindane emulsion per acre, or 4 fl. oz. of malathion per acre.

One of the liquid preparations should be mixed with a convenient quantity (15 to 20 gallons) of water, or one of the powders mixed with superphosphate, and applied just before the seedlings emerge.

This treatment will rid the paddock of springtails for about a fortnight and enable the crop to get through the springtail-susceptible stage without damage.

—*M. G. BOYER,*
Instructor in Agriculture,
Department of Agriculture,
Te Awamutu

Mr H. Anderson Retires from Department

MR H. ANDERSON, Superintendent of Fertilisers in the Department of Agriculture, has retired after 42 years in the Public Service. He joined the Post and Telegraph Department in 1918 and served with the Transport Department from 1935 to 1948.

When Mr Anderson joined the Department of Agriculture in 1948 not only was there a general shortage of fertilisers, but getting the available fertiliser to the farmer was a big problem. Mr Anderson's previous experience in the Transport Department was of considerable value in the reorganisation of lime transport and the working of the lime transport assistance scheme. He was chairman of the Lime Transport Advisory Committee.

Mr Anderson accompanied Dr G. L. Bridger, head of the Department of Chemical and Mining Engineering at Iowa State College, on his 1951 study of fertiliser production and problems in New Zealand. He was also secretary of a committee of Government officers and representatives of the fertiliser industry which was formed to assist Dr Bridger.

In 1952-53 Mr Anderson made a survey of the fertiliser requirements of the Dominion. During his service four new superphosphate works were built, three in the North Island and one in the South, and he was able to give the companies much valuable advice on the potential demand for fertilisers in their districts.

[*Royle*

Mr Anderson.

Mr Anderson worked in close cooperation with fertiliser manufacturers, lime millers, and merchants. His wide experience and knowledge of commerce were invaluable to the Department and the industries concerned during a period when there was considerable expansion of lime and fertiliser production.

Recent Research Work

TRIALS WITH THIRAM AS SEED AND RIPENING GRAIN PROTECTANT

As Bird and Slug Repellant on Seeds

THE commercial fungicide thiram has been used overseas as a bird repellant, the method being to wet the seed in an asphalt emulsion containing one part of asphalt to three parts of water and then to coat the seed with powder containing one half of thiram and one half of an inert ingredient.

Preliminary tests have been carried out at the Department of Agriculture's Rukuhia Soil Research Station on this use of thiram as a bird and slug repellant on seeds. The method used was to make the seed just sticky with rubber solution diluted with an equal quantity of white spirit and to mix the commercial thiram powder with the seed until it was dry and free running. The mixing could be conveniently done in a concrete mixer. The seed was then aired for a few hours before being bagged. A quarter pint of diluted rubber solution was adequate for 10 to 15 lb of large seed such as maize, peas, or wheat, and thiram powder equal to one tenth of the weight of the seed was used. This is probably more than necessary.

After sparrows had been fed on barley and peas until a flock was in regular attendance, small areas of barley and peas, both treated and untreated with thiram, were sown. The untreated seed was completely removed, while the treated seed was apparently untouched and germinated well.

Two small bare areas adjacent to long grass were oversown with treated and untreated subterranean clover. Slugs destroyed most of the untreated seed, but no damage could be observed on the treated area until well after all seed had germinated, when heavy frost lift destroyed the trial.

Thiram is probably injurious to inoculants, but slug damage is such a big factor in the success of oversowing that where inoculation may not be critical thiram as a slug repellant is well worth a trial.

—*T. F. SOUTHON, Rukuhia*

• • • •

To Prevent Losses in Ripening Grain

RIPENING grain crops are often attacked by birds, with resulting loss of grain. A bird repellant that could be used to protect these crops would therefore be very useful, particularly in experimental work where comparatively small, often isolated, plots, very subject to bird attack, are used.

In 1958-59 several trials were conducted during summer and autumn in various localities to test the effectiveness of thiram as a repellant. The results achieved, however, were not very promising. Sometimes the expected bird attack did not occur, and at others extensive bird damage occurred in both treated and untreated areas. It is possible that in the latter cases rain washed off the treatments.

Thiram was applied at 4 lb per acre of 100 per cent material as a spray with water. A "sticker" was used in the spray to give additional adhesion. The time of application was, generally, at the milky to early dough stage.

The most detailed trial was conducted at **Invermay Research Station**, when three treatments were compared on wheat, namely control (untreated), thiram, applied on 31 December, and thiram, applied on 31 December with repetitions after each appreciable rainfall (actually applied on 31 December, 16 January, 4 February, and 13 February). When the last treatment was applied no traces of the previous applications could be observed.

Plots were sampled for yields on 2 March, and it was observed that not much bird damage had occurred in any plots, and there were no visible differences. This was confirmed in the yields from threshing.

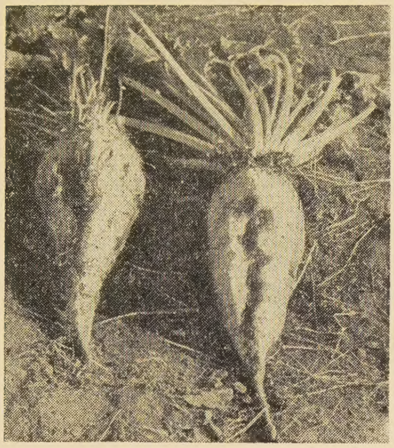
At **Winchmore** four small plots were treated with thiram on 5 December, when wheat was in the milky stage. At this time sparrows were observed feeding on the wheat. On 12 December only light damage had occurred. However, on 17 December after three wet days (a total of 1.05 in. of rain), severe bird damage had occurred on both treated and untreated areas.

At **Marton** wheat plots in the early dough stage were treated on 18 December. There was no obvious bird damage at the time of application nor was any observed for some time after. Heavy rain which was followed by a long period of unsettled wet weather no doubt removed much of the thiram which had been applied.

At **Rukuhia Soil Research Station** heavy bird damage was occurring in a wheat trial when the grain was immature. A small area was sprayed with thiram to repel the birds, but it was observed that though the damage might have been delayed, the effect was only temporary. Barley which was being stripped by birds was also treated, but ineffectively.

—*K. COTTIER, Wellington*

Successful Culture of Fodder Beet



THE inclusion of a small acreage of fodder beet in the winter feeding programme is now standard practice on many dairy farms in the South Island. In the North Island the crop is more favoured by farmers engaged in pig meat production.

WELL drained paddocks, rich in organic matter, should have been ploughed during late winter for the growing of this highly nutritious crop. From September onward the main concern is to obtain before sowing the germination and destruction of weed seedlings and the preparation of moist, firm seedbeds. For early feeding the crop should be sown in September and where later feeding is required from mid October to mid November.

The method of sowing will be determined by local practice. Some farmers drill on ridges because of adequate moisture; others in Canterbury drill on the flat. In some of the warmer parts of the North Island and Nelson - Marlborough transplanting with the aid of spray irrigation is successful. Row spacings should be at a minimum of 21 in. and up to 28 in. apart to allow the maximum period for interrow cultivation. Individual plants should be spaced 12 in. apart in rows to permit full development of roots and tops.

Seeding Rates

Seeding rates vary from 3 to 6 lb per acre, but 4 lb per acre is considered satisfactory for most soil conditions. While thinning and singling of the crop is a time-consuming job, it is perhaps the most important single operation associated with the crop's growth and development, and time expended here will result in a healthy, high-yielding crop.

As fodder beet is susceptible to hormone spray, weedicides cannot be used with safety. Emphasis must remain on sound cultural practices to control weeds. Fertilisers used will again vary with district practice, but as the crop is a gross feeder (its requirements are higher than those of most other crops), a liberal supply of a well balanced phosphatic and nitrogenous manure will pay dividends. Up to 10 lb per acre of borax may have to be included because of possible deficiency of boron, which causes the degenerative disease hollow heart.

Tested Varieties

The varieties tested for their yielding capacity over a wide range of soil types in Canterbury and for their suitability for feeding and ease of lifting are, in order of merit: Korsroe, Yellow Daeno, and Red Otofte. The variety Pajbjerg Rex is particularly suitable for feeding to pigs because of its higher dry matter content.

The successful culture of beet demands attention to early and adequate cultivation, the correct fertiliser, careful thinning, and effective weed control. Such attention will be reflected in increased yields of dry matter per acre at the time of harvest.

—*D. J. G. DAVIES,*
Fields Instructor,
Department of Agriculture,
Christchurch

Runner Development of Redgauntlet Strawberry Plants Stimulated by Cool Storage

By K. C. HOCKEY,
Massey Agricultural College, Palmerston North

IT is well known that certain strawberry varieties produce more runners than other varieties. It is also well known that any given variety will produce more runners in one season than in another. It has been generally accepted that the quantity of runners produced is governed by the growing conditions during the period of runner production. This is, I think, correct up to a point, but it is not generally accepted that the winter conditions to which the parent plants are subjected will have a bearing on the number of plants produced in the following growing season.

WITH this point in mind a trial was laid down by the Horticultural Department at Massey Agricultural College to see if storage for a period at low temperatures in the winter would have any effect. This trial was conducted with the variety Redgauntlet.

On 9 May 1958 plants for cool storage treatment were lifted and packed in sphagnum moss after all large leaves and soil had been removed. They were placed in a cool store operating at 38 degrees F and left there for 90 days. Untreated plants were planted in the field on 9 May and were, of course, subject to ordinary winter conditions during the 90 days that the treated plants were in cool store. On 9 August treated plants were planted in areas that had been left vacant when the untreated plants were planted.

The following results were obtained:

Runner Development

Treated plants first showed development in the first week in October, with all plants developing runners by the end of October. Untreated plants showed no signs of runner development until 20 November.

Plants Harvested

No record of individual plant size was taken, but all plants with root development were counted. The following table gives the plants harvested from six separate one-yard-square plots of treated and untreated plants.

PLANTS HARVESTED

Treated		Untreated	
Plot (1 sq. yd.)	No. of plants	Plot (1 sq. yd.)	No. of plants
1	184	1	97
2	194	2	90
3	174	3	99
4	182	4	81
5	168	5	110
6	157	6	104
	1,059		581

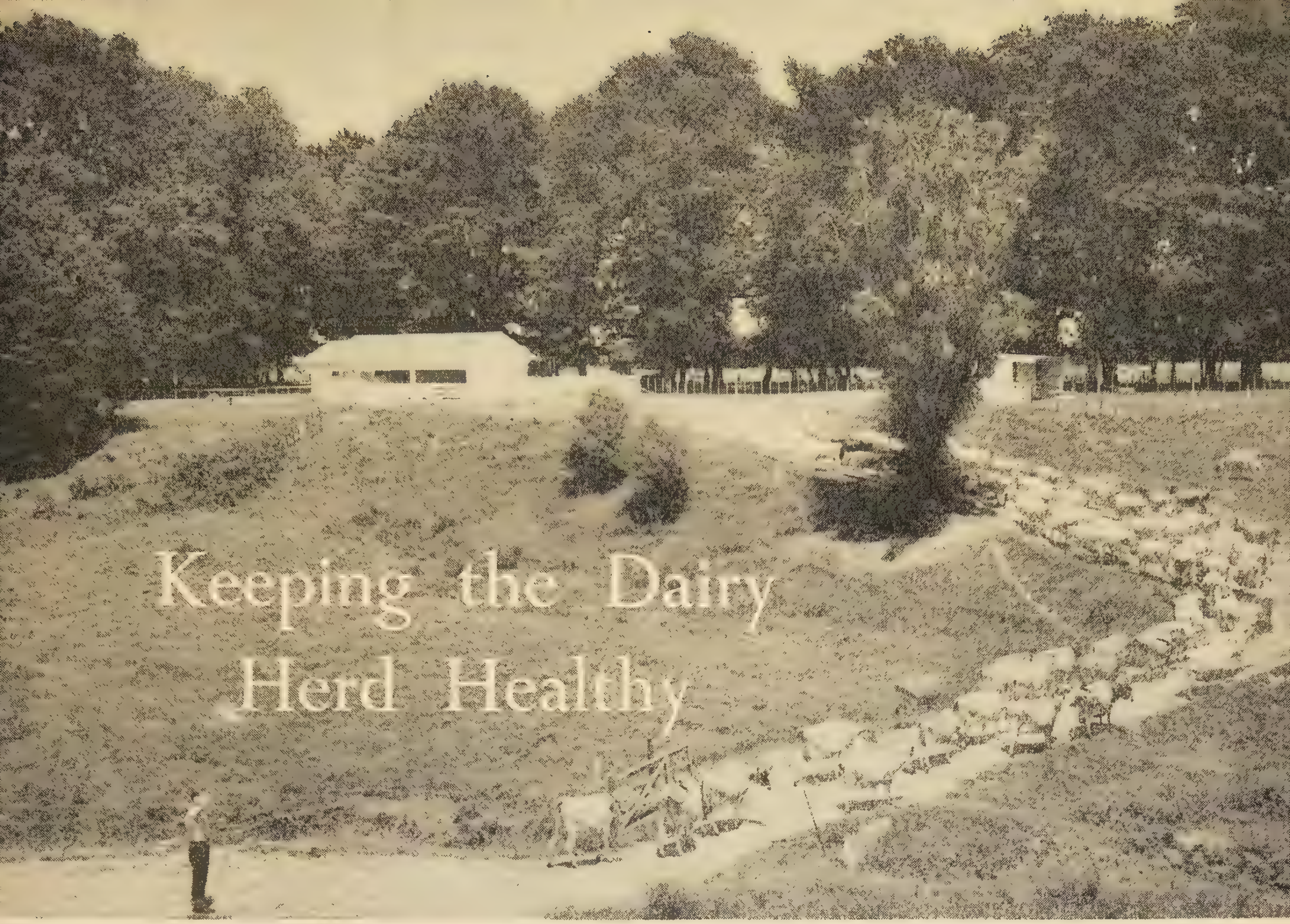
Average per plot 176.5 Average per plot 96.8

The above figures indicated that runner development in the Redgauntlet was stimulated by the conditions given to the treated plants. Whether similar results would be secured with other varieties is a matter for further study. It is possible that results would not be similar for this variety in another season or in another locality where natural winter conditions were different, but if low temperatures do play a part in runner initiation, the practice of cool storing these plants intended for runner production would be advantageous, particularly in areas where the winters are relatively warm.

It is not suggested that a temperature of 38 degrees F or a period of 90 days' storage at this temperature are the optimum. These were decided on as likely to give some results.

The plants were, of course, stored in complete darkness, without soil or leaves, so other factors beside temperature may have had some effect.

Keeping the Dairy Herd Healthy



[National Publicity

THE health of a dairy herd is of paramount importance to the owner, whether his objective is high production per acre or per cow. Neither will be obtained with an unhealthy herd, and, obviously, net profit is cut by every form of wastage. Ways in which disease wastage may be reduced by using not only specifically veterinary methods, but also by intelligent application of the management techniques recommended by the Ruakura Animal Research Station for feeding dairy cows, were outlined to the Ruakura Farmers' Conference in June by T. Wallace, formerly Veterinary Research Officer, Ruakura, and now of the Cambridge Veterinary Club.

FARMERS who expected recommendations for treatments for diseases and a long list of remedies would have been disappointed, as Mr Wallace emphasised his belief that a general policy should be framed to prevent entry of infectious diseases into the herd. Prevention by management rather than cure was the theme of his address, an adaptation of which follows.

General Policy

Dairy farmers should:

1. Make full use of the vaccination programmes and advice on disease prevention provided by veterinary surgeons. The difference between successful veterinary work on one farm and poor work on another is usually the difference in mental approach to animal health by the respective owners.

2. Follow a closed herd policy as soon as possible to prevent the introduction of infectious or venereal diseases.

The use of artificial breeding and the retention of a bull calf each year, or the purchase of an unused yearling bull from a known healthy herd or, better still, a day-old bull calf are the best methods to continue herd improvement without introducing disease. Admittedly, with so much land development taking place, new owners must buy stock, but before this is done professional advice should be sought.

3. Have the herd tuberculin tested, because tuberculosis can be an insidious and sometimes vicious cause of herd wastage. A very firm opinion among veterinary surgeons in Britain is that other diseases in tuberculosis-free herds are less complicated and more amenable to treatment than those in infected herds. New Zealand now has an eradication scheme that makes tuberculosis testing reasonably economic.

4. Arrange to have the vaccination programme advised by the veterinary surgeon carried out annually without fail.

Rearing of Young Stock

Calves should be born in dry, sheltered paddocks and allowed to suckle their dams for the first 48 hours. It is only from colostrum in the first 48 hours that the calf can receive the disease-resistance factors built up by

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its dam in her lifetime. This protection remains effective in the calf for about six weeks and allows time for the establishment of its own disease-resisting mechanism. This is absolutely essential and it is a most important part of the dairyman's job to see that the calf receives its colostrum in those first two days. The calf should be placed indoors in a dry, warm spot when removed from its dam and after 24 hours taught to drink.

If any calf develops scours, it should be isolated immediately and treated. The indoor shelter should be used only for wet or cold weather, and as soon as possible the calves should be rotated around paddocks containing good, leafy pasture. They should be shifted each day if possible, and certainly should not remain longer than seven days in a paddock.

Because coccidiosis causing blood scours can become a problem on permanent calf paddocks, the absence of concentration of calves under the rotational system overcomes this disease.

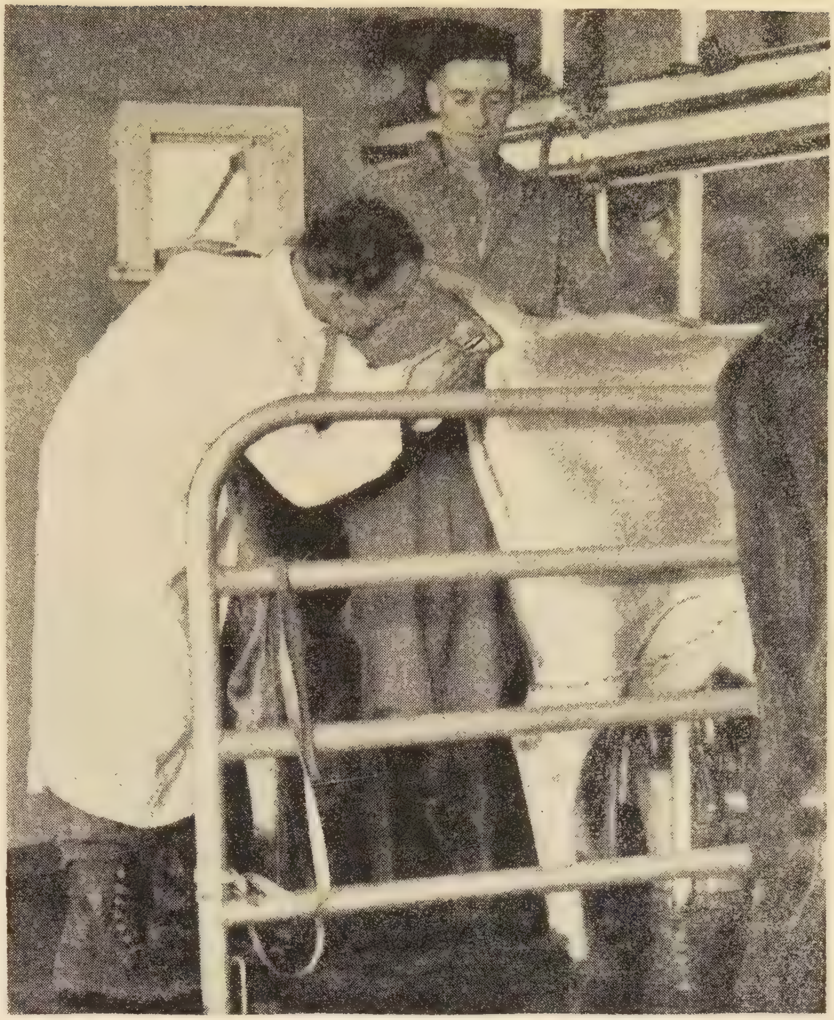
Weaning, especially early weaning at eight weeks, should be carried out only when there is good pasture available. After weaning, the calf group must not be forgotten as it seems to be on many farms. The calves must be regularly moved to a fresh paddock. Worms are no problem when calves are robust and well fed, and the rotational system prevents the build-up of a heavy worm burden.

Calves should be considered as very sensitive animals, easily checked by drops in feed quantity or quality. A check for even a week results in rapid loss of thrift and makes the calf susceptible to worms and bacterial infections such as pneumonia. Once calves have become emaciated it is most difficult to restore them to health.

The autumn flush of pasture can be a danger period and coincides with ill-thrift in hoggets. Neglect at this time often results in an emaciated mob of yearlings.

Some top-quality hay or silage or even concentrate at this critical period is necessary on many properties to ensure that the calves go into winter in good condition. Well reared yearlings do quite well on silage and hay plus some grass during winter and are ready for mating at the correct time. Poorly reared yearlings, especially of the heavier breeds, fail to "come on heat" at the desired time.

If fed adequately during their pregnancy and particularly well just before calving, these animals are equipped to produce to their maximum as two-year-olds. However, it must be remembered that they are still young, growing cattle, with demands on their food intake for lactation, growth, and foetal development, before they are dried off as rising three-year-olds.



Testing for tuberculosis. Dairy farmers should have their herds tested for this disease, which can be an insidious and sometimes vicious cause of herd wastage. Also many veterinary surgeons consider that in tuberculosis-free herds other diseases are less complicated and respond more easily to treatment than diseases in a tuberculous herd.

It is well worth while separating the rising three-year-olds from the main mob of dry cows and wintering them with the rising two-year-olds so that both age groups can receive special attention.

It must be emphasised that well reared heifers are the basis of a healthy herd.

Though these methods of rearing young stock, propounded from Ruakura over the last decade, have been well proven, they are sadly neglected by a large percentage of farmers.

Vaccination

The calves should be vaccinated at four to six months of age against brucellosis.

If there is a history of leptospirosis in previous years' calves, or if pigs have grazed over paddocks to be later grazed by the calves, vaccination for this disease is recommended.

Vaccination for blackleg at three to four months of age should be carried out if the history of the property warrants it.

Diseases of the Dairy Herd

Johne's Disease

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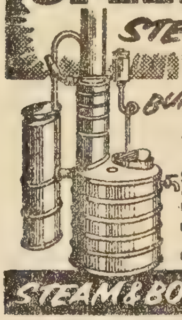

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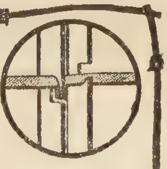

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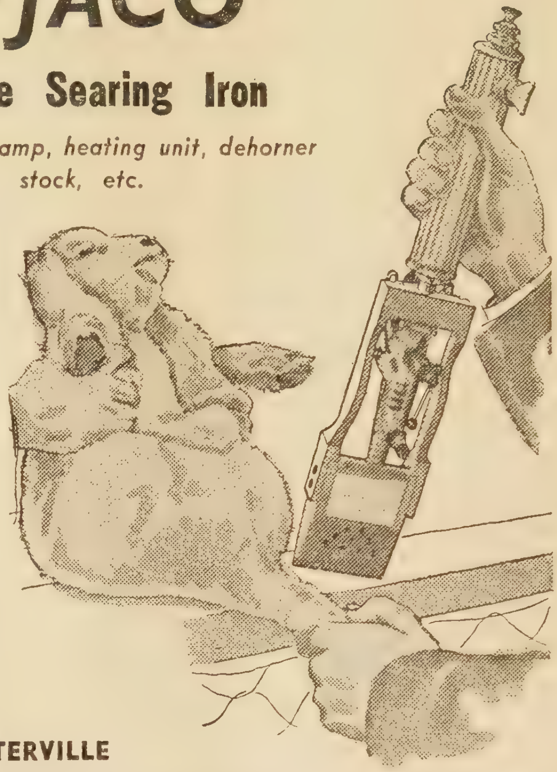

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insidious and must be costing the dairy industry considerable loss in deaths and lowered production. Because there is no reliable test to detect carriers, a closed-herd policy is the only safeguard. If stock must be bought, the first necessity is to check on the vendor's herd history, but this still leaves considerable risk, because carrier animals may develop symptoms years after the initial infection.

Any cow that shows persistent bubbly scouring should be examined by a veterinary surgeon, so that specimens can be taken for a laboratory check.

Herd Infertility

The known infectious diseases causing herd infertility are vibriosis and trichomoniasis, which are true venereal diseases spread by infected bulls. The purchase of a bull that has been used in another herd is most unwise unless the vendor allows the buyer's veterinary surgeon to investigate the disease history of that herd and assess the risk. As trichomoniasis is rarely diagnosed now, the main consideration is vibriosis.

Because *vibrio* infected bulls can carry the disease and an infected cow can become pregnant and have a normal full-term calf, it should be assumed that all animals with an unknown history are infected. Fortunately the organism is easily eliminated from the cow by irrigation of the uterus with streptomycin, thus providing a powerful weapon in preventing its entry into a herd. Bought cows can be treated by a veterinary surgeon well before mating and also allowed to have two clear heat periods, and any cow served by a stray bull should be treated within 72 hours. The necessity for these precautions cannot be emphasised too strongly, as financial disaster to many dairy farmers has resulted from the visit of a stray bull or the purchase of an infected animal. Good boundary fences and safe bull paddocks are extremely valuable in disease control.

A recent survey of infertility in the Waikato showed that the majority of herd breeding problems are of unknown cause. There is a considerable amount of evidence at various research centres that nutritional factors have a marked influence on fertility.

Because underfeeding is one of the causes of infertility, all possible steps to feed the herd well during late pregnancy and early lactation should be taken.

Until plant chemists and animal nutritionists can tell more about that unknown entity called "quality" in pasture, it is wise to feed either some silage or hay with 4 to 6 in. high pasture, at least for the first month of mating, when grass is extremely lush.

Individual Infertility

Infection of the uterus (metritis) will make a cow infertile, and this condition often results from retention of the membranes. Any cow that retains the foetal membranes for more than three days, or is obviously ill, should be treated, and all such animals recorded and presented for a final veterinary examination before the mating season begins. Infection cleaned up then pays dividends in time saved.

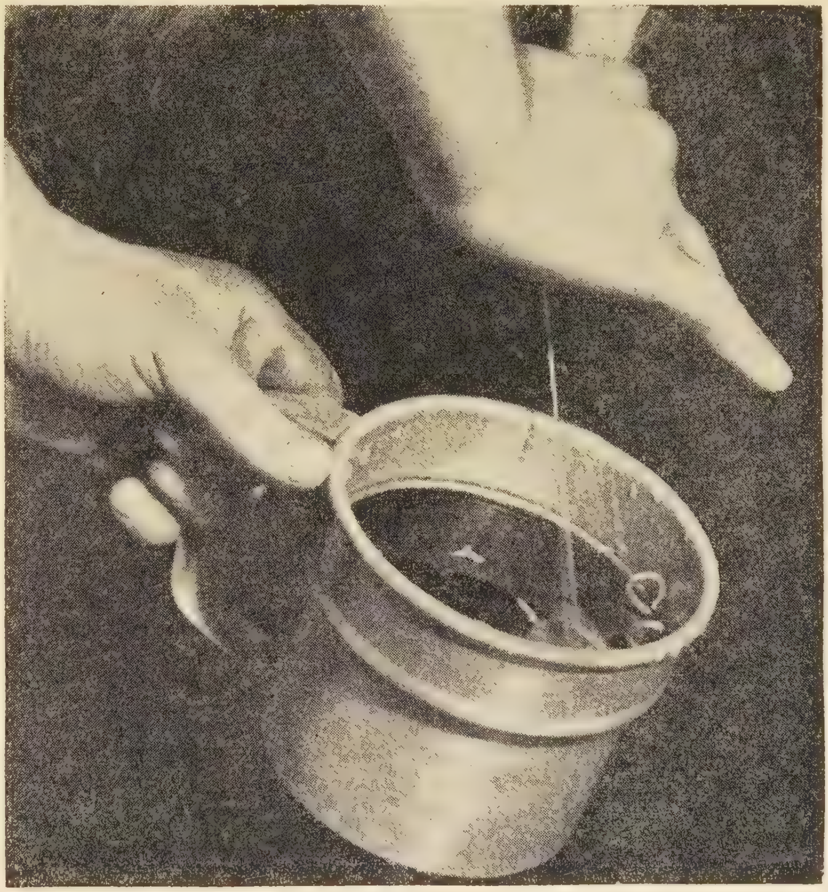
Abortion

The three main infectious diseases resulting in abortion are brucellosis, leptospirosis, and vibriosis, with brucellosis responsible for the great majority.

Brucellosis: Calfhood vaccination with Strain 19 vaccine has been very successful in reducing the incidence of this disease in all countries using it. Vaccination can never be 100 per cent successful and as it is true to say that New Zealand has elected to live with brucellosis, it is important that every herd owner should realise the limitations of Strain 19. The protection it provides can be broken down by a heavy, virulent infection, as might occur from a *Brucella* abortion case.

A closed herd with annual calf vaccination is the best control method at the moment. If females must be bought, the order of preference is:

1. Calves.
2. Vaccinated two-year-old heifers with a negative history of abortions in the in-contact animals.
3. Cows from a vaccinated herd with a history of freedom from *Brucella* abortions.



An important step in the control of mastitis is examination of the foremilk, preferably in a strip cup, toward the end of the stimulation period, the thumb and forefinger only being used to draw a stream of milk from the teat. A cardinal fault is to allow milk to run over the hands and wrists, because from the hands milk is transferred to other udders, back chains, and bail handles.

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CONTROL OF BUTTERCUPS

PRODUCTS RECOMMENDED:

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Other Varieties of Buttercup—
TARTAN M.C.P.A.
TARTAN 2,4-D BUTYL ESTER
All Varieties where clover damage must be avoided —
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DOSAGE RATES:

Field Buttercup and Creeping Buttercup—
M.C.P.A. 3-4 pints (1½-2 lbs acid equivalent) per acre.
Above where clover damage to be avoided—
M.C.P.B. 5 pints (2 lbs acid equivalent) per acre.
Other Varieties of Buttercup—
M.C.P.A. 2 pints (1 lb acid equivalent) per acre.
2,4-D BUTYL ESTER 2 pints (1 lb acid equivalent) per acre.
Above where clover damage to be avoided—
M.C.P.B. 3 pints (1-1¼ lbs acid equivalent) per acre.

TIME OF APPLICATION:

Field and Creeping Buttercup should be sprayed about October, as soon as flower stalks begin to form. Other varieties should be sprayed at this stage where possible, but may still be treated at any stage of vigorous growth.

GENERAL DIRECTIONS:

At least eight kinds of Buttercup occur in New Zealand pasture. It is desirable to recognise the two named as they are harder to kill than the others, and a repetition spraying is often necessary.

M.C.P.A. may be sprayed in July or August to minimise clover damage, but M.C.P.B. should not be used until the weather is warm.

2,4-D is less effective than M.C.P.A. on all Buttercups, especially on Giant and Creeping Buttercup. It is recommended only on the susceptible species and only in showery weather.

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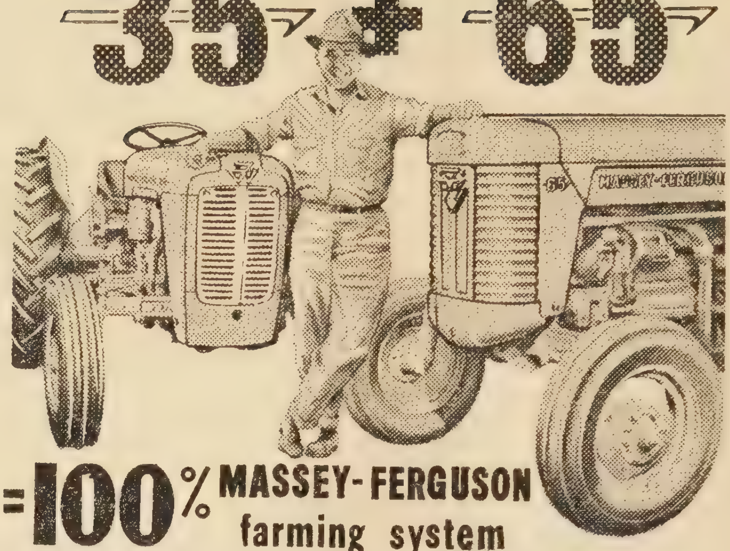

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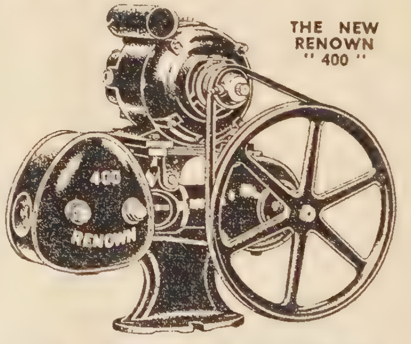

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The well grown 18-month-old heifers shown here with some older cows were wintered entirely on silage and pasture. At the time of the autumn flush of pasture, which can be a danger period because of unthriftiness, some top-quality hay or silage or even concentrate is necessary on many properties to ensure that calves go into winter in good condition. Well reared yearlings do quite well on silage and hay plus some grass during winter and are ready for mating at the correct time.

Leptospiral abortion usually occurs during the last two months of pregnancy, but can occur at any stage. The infection can be carried by pigs, which appear to act as hosts for the organism. Because of this sows should not be run over dairy pastures, but if this is unavoidable, the cows should be vaccinated at least once against leptospirosis. Vaccination during the last three months of pregnancy will protect the cows and, incidentally, protect their calves against redwater if they receive colostrum.

Vibrionic abortion is not a common cause of abortion as such, and this infection has already been discussed under infectious infertility.

Macrocarpa abortion: Macrocarpa when eaten by pregnant cows causes abortion, and access to leaves either on living trees or fallen branches should be prevented.

Generally every case of abortion should be investigated by a veterinary surgeon and the farmer should keep for him specimens, foetal membranes, and the foetus if available. Any material not required for the laboratory should be buried deeply or burnt, and any aborted cow isolated until all discharges have ceased.

Milk Fever

Little preventive action can be taken in New Zealand to lower the incidence of milk fever. Unless it is complicated it is no longer a serious condition, but it can reach intolerable levels if a very liberal grass feeding programme to mature dry cows is followed. If the dry herd is split into two groups, as already suggested, one group of two- and three-year-olds and the other of four years and over, only the latter need be restricted in their grass intake. It would be preferable to limit pasture grazing of the older cows to about two hours or even less a day, with adequate silage and hay.

The younger group can be fed as liberally on grass as possible.

Ketosis (Acetonaemia, Acidosis) and Grass Staggers

Ketosis and grass staggers appear to be so closely associated in New Zealand that it is convenient to discuss their prevention together. Both conditions are likely to occur in animals receiving insufficient energy in their feed at the time when their requirements are at a maximum, that is, late pregnancy and the first six weeks of lactation. Therefore, farmers should ensure that the feed intake of the herd is increased over the last three to four weeks of pregnancy and that ample feed is available for the early lactation period, until grass growth overtakes requirements. If there is an overall shortage, it is best to conserve feed for the after-calving period. If feed must be restricted during the dry period, the most severe restrictions should be immediately after drying off.

It is disastrous to allow shortages at the critical periods, as a high incidence of ketosis and grass staggers often results. Not only do checks in feed supply predispose cows in milk to metabolic diseases, but, as Massey College and Ruakura workers have shown, if extended for more than five days, they reduce production for the whole of that lactation.

Mastitis

The recent survey of the mastitis position by the Dairy Board shows that 12.2 per cent of approximately 26,000 cows were affected and of these 11.7 per cent were culled because of the disease or subsequent low production.

The incidence of mastitis has remained fairly static over the last ten years, despite penicillin keeping the disease in check.

The incidence in 101 herds in 1947-48 was 14.1 per cent of cows and 4.8 per cent of the quarters, and in 398 herds in 1957-58 12.2 per cent of the cows and 4.3 per cent of the quarters. We must recognise that mastitis is as much with us as ever.

The control measures suggested are essentially practical. It should be emphasised to everyone milking that the only way infection is likely to be spread in a herd is via the hands and the teat cups. Therefore:

1. Use running water from a bail hose, with soap to wash the udder and stimulate a good let-down.

2. Examine the foremilk toward the end of the stimulation period, preferably in a strip cup, using the thumb and forefinger only to draw a stream of milk from the teat. Do not allow milk to run over the hands and wrists. This is a cardinal fault, because from the hands milk is transferred to other udders, back chains, and bail handles.

3. Rinse off the soap if desired and at the same time wash the hands.

4. Have on hand an approved dairy disinfectant for dipping cups and sterilising hands if an infected cow has been milked or handled.

5. Operate correctly adjusted milking machines efficiently. Milking shed organisation must be planned so that milkers can operate the machines correctly. Teat cups should be applied to properly stimulated udders and removed immediately the milk flow has ceased.

A common fault in New Zealand milking sheds is the attempt by milkers to operate too many teat cup units, with the result that cups crawl up on the teats and damage udder tissue when milk is not flowing.

Finally in a mastitis-control policy it is well worth while attempting to keep a commercial herd reasonably young. The economic theory in keeping good cows to as great an age as possible, thereby reducing the overhead cost of rearing up to the milking age, is sound, but from a disease angle the following figures, taken from the 1958 Dairy Board report, give food for thought:

DISTRIBUTION OF MASTITIS ACCORDING TO AGE OF COW

Age of cow years	Number of cows affected with mastitis	Percentage of age group affected
2	251	6.2
3	267	7.4
4	320	9.4
5 to 9	1,478	16.2
10 and over	410	19.0
Total cows affected	2,726	12.2

In the light of the high percentage of wastage in the ten years old and over group a good case can be made out for a young herd.

Bloat

The complexities of the bloat problem are so well known that they need no repetition here. The technique evolved by workers of the Plant Chemistry Division and Grasslands Division, Department of Scientific and Industrial Research, for pasture spraying using fat or oil is fully described in an article in the July 1959 issue of the "Journal of Agriculture" and in a Department of Agriculture bulletin which will be available later.

At the moment this offers the best means of control.

Penicillin appears to be very useful for troublesome animals which can be individually dosed and gives protection for two to three days.

Salmonellosis

Salmonellosis seems to be increasing in incidence each year. The disease is characterised by severe diarrhoea and often the passing of blood in the faeces, and death frequently occurs in 24 to 48 hours.

At the moment there is no method of detecting carrier animals, which are the main source of infection. The only measure that can be recommended is to isolate immediately and have treated any cow suspected of having the disease.

Facial Eczema

The advice of district Facial Eczema Warning Committees should be heeded. If necessary, all stock, particularly young animals, should be shut up during danger periods. Dairy herds fed on silage or crops only for these short periods in autumn produce reasonably well and recover as soon as they are allowed back into pasture. It is much wiser to lose some production than gamble with the health of the herd.

Foot Rot

Foot rot can be troublesome. It seems to appear suddenly in a herd, but it is considered that the organism remains on normal feet and these provide the reservoir of infection.

As a rule the simplest method of control is to treat cases immediately they occur with a penicillin injection, but if cases become too numerous, the use of a 5 to 10 per cent bluestone foot bath should be considered. This can be sited in the exit race and the whole herd put through it for at least a week if one or two cases occur.

Every problem met by the herd owner has not been covered in this article. Only broad principles have been covered, the aim being to stimulate more intense interest in disease prevention rather than treatment.

On any specific problem, consult your veterinarian, and when a health programme involves finance and farm management call in also your farm adviser (Dairy Board consulting officer, Farm Improvement Club adviser, or Department of Agriculture economist) to discuss methods and costs within the scope of the farm budget.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during April 1959 and for the 9 months ended 30 April 1959 with comparative figures for the same month and the 9 months of 1957-58 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
April 1959	10,903	233	11,136	—
April 1958	10,997	213	11,210	—
Increase or decrease	—94	+20	—74	—0.660
9 months ended 30/4/59	170,824	2,590	173,414	—
9 months ended 30/4/58	167,031	2,727	169,758	—
Increase or decrease	+3,793	—137	+3,656	+2.154

Butter in store at 30 April 1959 was 37,772 tons

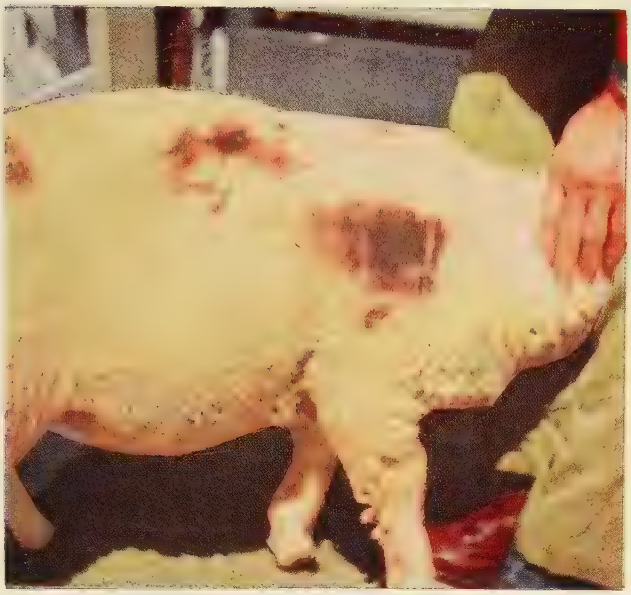
CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
April 1959	6,800	47	6,847	—
April 1958	5,982	1,161	7,143	—
Increase or decrease	+818	—1,114	—296	—4.144
9 months ended 30/4/59	61,351	13,423	74,774	—
9 months ended 30/4/58	72,313	12,726	85,039	—
Increase or decrease	—10,962	+697	—10,265	—12.071

Cheese in store at 30 April 1959 was 19,656 tons

If these figures are converted into butterfat equivalent, there is a decrease of 0.465 per cent in butterfat graded for the 9 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Phenothiazine Wool Stain



By J. E. DUNCAN,
Wool Supervisor, Department of Agriculture,
Wellington

- **The worst wool stain—completely unscourable.**
- **Wool buyers always penalise it heavily.**
- **Much staining is due to carelessness and is therefore preventable.**
- **Remaining stains can and should be picked out at shearing.**
- **The wool industry cannot afford this unnecessary handicap in its competition with synthetic fibres, which are free of any kind of stain.**

Phenothiazine is closely related to the dyestuffs used for dyeing wool.

It gets on to wool in three ways:

1. By careless spilling of liquid drench on sheep's fleeces.

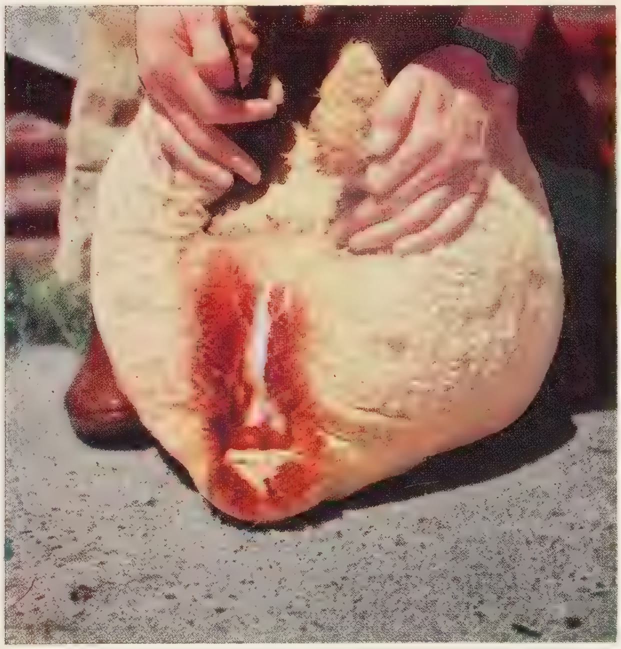
2. By sheep slobbering drench on one another, particularly if they are packed in the yards for longer than necessary.

Use of pellets instead of liquid drench will overcome 1 and 2.

3. When passed in the urine it still stains wool (illustration at right), but the damage is localised.

At shearing time **all** phenothiazine stains should be picked out and **kept and sold separately** because of their inferior value.

If buyers find much of this stain in your clip, they will certainly discount their prices and may refuse to bid on the wool at all.



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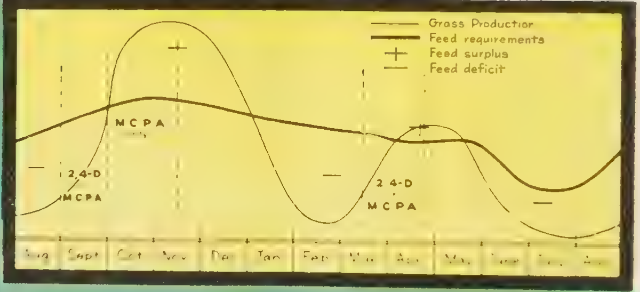

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IW.76 W

Control plot showing prolific growth of spurrey.

Control of spurrey and sheep's sorrel by CIPC at 2 lb per acre.

Spurrey Control in Brassica Crops

IN many districts spurrey or yarr (*Spergula arvensis*) is a troublesome weed in turnip, swede, and kale crops. The vigorous growth of spurrey seriously reduces the yields of these crops. Spurrey is worst in districts where frequent showers occur during December and January and where the brassica crop is sown on ground which has been cropped in the preceding season. Where brassicas are sown on ridges spurrey may be controlled by intercultivation of the ridges, but in some areas this is difficult and expensive.

By R. C. STEPHEN,
Instructor in Agriculture,
Department of Agriculture,
Balclutha

IN the past control of spurrey in brassica crops by weedicides has been unsuccessful due to the extreme damage caused to the crop by the more common weedicides. However, during the past two years trials have been laid down in south Otago to test the efficiency of "pre-emergence" applications of various weedicides as a control of spurrey in brassica forage crops and to examine the reaction of the crop to the application of these weedicides.

Treatments 1956-57

In the 1956-57 season the weedicides and rates of application used in pre-emergence applications on a ridged crop of swedes and white-fleshed turnips were TCA at 10 lb and 20 lb per acre, propham at 1 lb and 2 lb per acre, and CIPC at 1 lb per acre. These materials were applied in early December to the surface of the seedbed two days after the seed had been sown on ridges but before the seedlings had emerged from the ground. For the rest of the month temperatures were moderate and rain (1½ in.) adequate, with the result that a successful establishment of crop but also weed seedlings occurred. Within six weeks the crop in general became heavily infested with spurrey, which formed a dense mat tending to smother the crop.

Germination Counts 1956-57

Germination counts after the crop had established indicated that propham at 1 lb and 2 lb per acre severely damaged the crop, causing a marked reduction in the density of the established crop (see Table 1).

TABLE I—GERMINATION COUNTS 1956-57

Treatment	lb per acre	Plants per 10 ft row	Difference
TCA	10	20	—
TCA	20	19.9	—0.1
Propham	1	14.4	—5.6*
Propham	2	9.9	—10.1*
CIPC	1	19	—1.0

* Differences significant at 1 per cent level

The TCA and CIPC treatments caused no damage to the crop.

Spurrey Control 1956-57

The pre-emergence applications of propham at 2 lb per acre and CIPC at 1 lb per acre gave complete control of spurrey. Propham at 1 lb gave only partial control of the spurrey, which, however, remained stunted and sparse

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CIPC at 1 lb per acre was used in the plot in the → foreground. Spurrey has suppressed the kale in the untreated area in the background.

↓ CIPC at 1 lb per acre controlled spurrey but not sheep's sorrel.

and did not interfere with the growth of the crop throughout the trial.

The TCA treatments did not control the spurrey, which soon formed a dense mat that restricted the growth of the crop on these plots.

Where the weedicides effectively controlled the spurrey the crop grew more vigorously and these treatments outyielded those plots where there was no control of spurrey or where crop damage had been too severe. In this trial propham at 2 lb per acre caused too much damage to the crop.

Application of propham at 1 lb per acre caused crop damage, but this was more than offset by extra growth due to control of spurrey; in other words there was a net benefit. CIPC at 1 lb per acre and propham at 1 lb per acre gave good control of spurrey and crop yields were improved (see Table 2).

TABLE 2—CROP YIELDS 1956-57

Treatment	lb per acre	Dry matter lb per acre	Difference
TCA ..	10	1,580	—
TCA ..	20	1,190	—390
Propham ..	1	3,340	1,760*
Propham ..	2	2,330	750
CIPC ..	1	3,520	1,940*

* Differences significant at 1 per cent level

Treatments 1957-58

In the following season 1957-58 a similar trial was put down on a crop of ridged kale. The weedicides used as pre-emergence treatments were propham at ½ lb, 1 lb, and 2 lb per acre, CIPC at ½ lb, 1 lb, and 2 lb per acre, and TCA at 20 lb per acre.

These materials were applied in the middle of December to the surface of the seedbed four days after the kale seed had been sown on ridges and before emergence of the seedlings. In the month after the application of the weedicides there were lower-than-average seasonal temperatures and heavier-than-average falls of rain, totalling 4 in. A prolific growth of spurrey together with scattered plants of sheep's sorrel (*Rumex acetosa*), docks (*Rumex* spp.), and fathen (*Chenopodium album*) established. The spurrey formed a dense mat about 9 in. thick.

Germination Counts 1957-58

Germinations counts (Table 3) were made after the kale had become established. The counts indicate that none of the treatments had caused any significant damage to the crop and that there was no reduction in the density of the crop.

TABLE 3—GERMINATION COUNTS 1957-58

Treatment	lb per acre	Plants per 10 ft row	Difference
Control ..	—	9.2	—
Propham ..	½	9.2	0.0
Propham ..	1	9	—0.2
Propham ..	2	9	—0.2
CIPC ..	½	8	—1.2
CIPC ..	1	9.5	0.3
CIPC ..	2	8.3	—0.9
TCA ..	20	8.5	—0.7

Differences not significant at 5 per cent level

Spurrey Control 1957-58

In this trial the pre-emergence applications of propham at ½ lb and 1 lb per acre and TCA at 20 lb per acre had no effect on the growth of the spurrey.

Spurrey was partially controlled with pre-emergence applications of propham at 2 lb per acre and CIPC at ½ lb per acre. The pre-emergence application of CIPC at 1 lb and 2 lb per acre gave complete control of spurrey. None of these treatments had any effect on the sheep's sorrel, fathen, or docks, except that the CIPC treatment suppressed the growth of sheep's sorrel.

Where spurrey was completely controlled the kale grew more vigorously and outyielded those treatments where control of spurrey was poor (see Table 4).

TABLE 4—CROP YIELD 1957-58

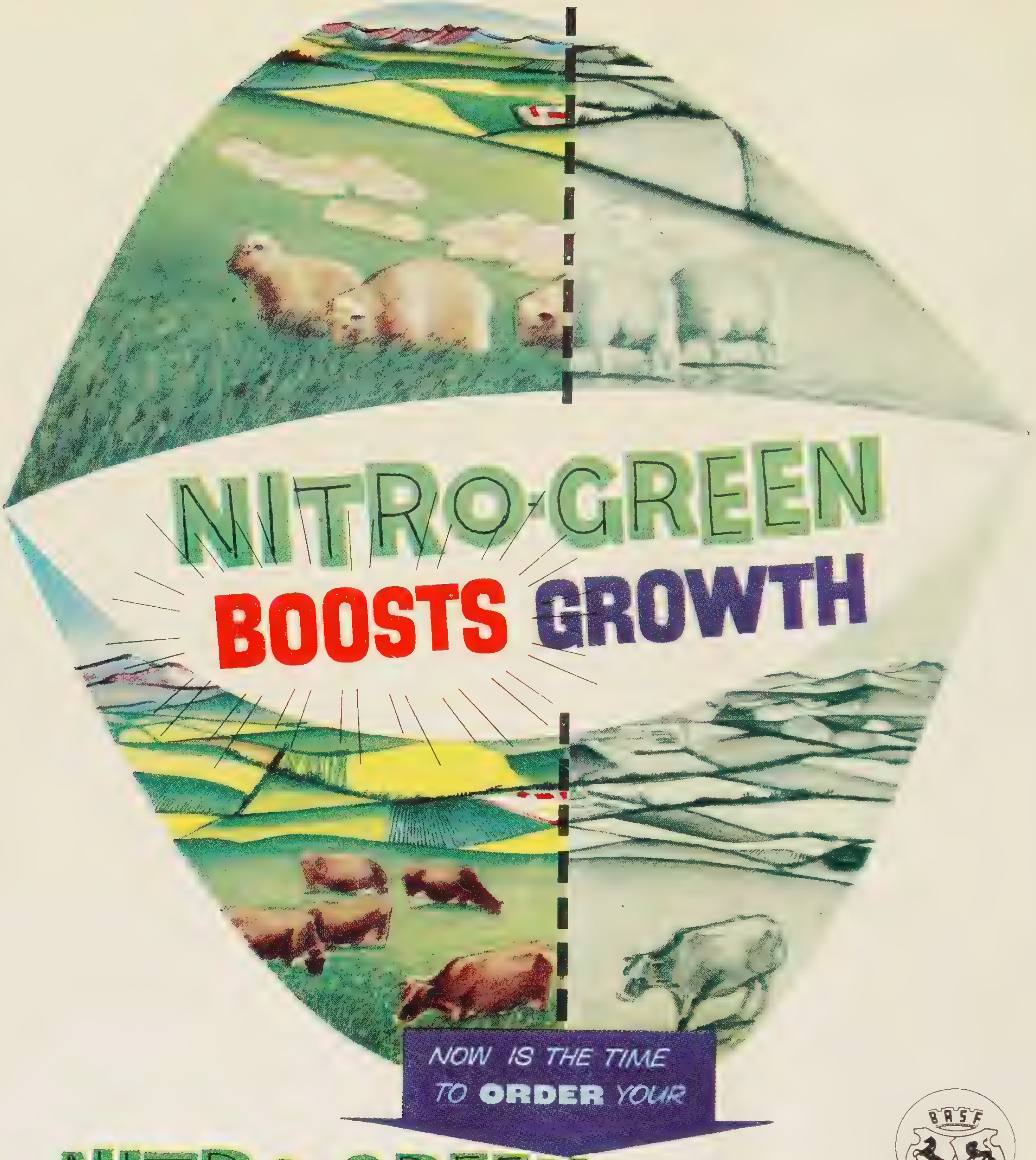
Treatment	lb per acre	Dry matter lb per acre	Difference
Control ..	—	790	—
Propham ..	½	880	90
Propham ..	1	1,200	410
Propham ..	2	1,060	270
CIPC ..	½	1,330	540
CIPC ..	1	1,670	880*
CIPC ..	2	1,720	930*
TCA ..	20	1,290	500

* Differences significant at 1 per cent level

Results of these trials indicate that pre-emergence applications of TCA cannot be relied on to control spurrey even when the weather is favourable; that pre-emergence applications of propham are likely to cause severe damage to the brassica crop; and that pre-emergence applications of CIPC at 1 lb can give adequate control of spurrey without causing crop damage.

In districts with higher summer temperatures CIPC at ¾ lb per acre would probably control spurrey.

In contrast to the favourable results obtained in south Otago, in some districts of the North Island where extremely high soil temperatures are common pre-emergence applications of CIPC have given variable results and cannot be recommended.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Manuka Blight Losing Effectiveness in North Island

THE mealy bug *Eriococcus orariensis* responsible for the disease known as manuka blight gave promise up to the early 1950s of effectively controlling red manuka (*Leptospermum scoparium*) throughout the country. Now, because it is itself being attacked by a parasite, the bug is no longer able to completely kill established stands or prevent seedlings growing on to the flowering stage in most parts of the North Island.

Survival of old manuka plants and seedlings in North Taranaki.

By C. J. HAMBLYN,
Fields Superintendent,
Department of Agriculture,
Palmerston North

THE bug, a species of scale insect thought to have come from Australia, attacks both red and white manuka and was first seen to be killing red manuka in the Orari Gorge and vicinity in South Canterbury about 1936. Since then it has spread or been spread by farmers throughout the country and there are now few districts where it is not found.

The effectiveness of the insect in killing manuka was keenly watched by hill country farmers especially, who saw in the fact that the mealy bug had completely killed off large areas of red manuka in South Canterbury by 1946 and was also able to kill seedlings within two years of their establishment a possible means of getting rid of this weed. At that time it was apparent that this scale insect was not itself controlled (as practically all such insects are in nature) by some other insect, fungus, or other agent and was therefore able to build up such heavy populations on the manuka plants that they succumbed to the attack. It was soon found, however, that whereas red manuka could be killed readily, the white variety, kanuka, was able to survive and the insect had little visible effect on this species.

Manuka in North Auckland showing green tips from which plants make recovery.

The early promise of the insect in the control of red manuka has, however, not been fully realised. A recent review of the position in all districts of both islands shows where and, it is thought, why the insect has failed.

South Island Position in 1958

During the past 20 years the mealy bug has spread throughout Canterbury, where it has killed off practically all established manuka (except in some remote areas of the Mackenzie Country, Banks Peninsula, and North Canterbury) and continues to control seedling growth by killing off the plants, usually before they are 2 ft high. It is thought to be a matter of time only before it gains control in the remoter areas, where it has been present for less than five years.

In Marlborough and Nelson it is now also widespread, though introduced

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Complete kill of a thick stand of manuka on a drier coastal area of Wairoa County. The dead scrub has been opened up by heavy stocking with cattle before reseeding and topdressing.

only in recent years, and here too established manuka is being killed and the seedlings controlled at an early stage. There are only a few places as yet in Westland where the insect is established and, though red manuka is severely damaged, the spread of the insect is relatively slow.

The mealy bug is now found in practically all districts of Otago and Southland. However, except for some areas in North Otago where it was introduced some 15 years ago and has dealt effectively with established stands and seedlings, it has not been present in most areas for much more than five years.

The spread of the insect over the country from sources of establishment has been noted to be much slower than in Canterbury, but experience so far indicates that, especially in the drier districts and also where frosts are severe and continuous over a period, the attack of the insect will result in the death of the manuka. No evidence has as yet been found of an effective controlling agent of the *Eriococcus* insect in the South Island, variations in the speed with which the insect spreads and can kill manuka being due, it is considered, to climate.

North Island Position in 1958

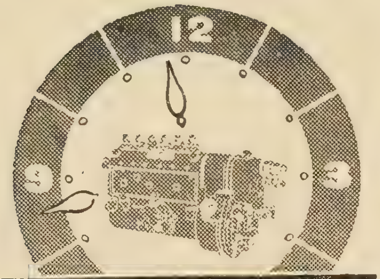
The story has been very much different, however, in the North Island. First introduced from South Canterbury in 1947 to Tangoio in northern Hawke's Bay and to Waihi Station some 30 miles inland from Wairoa by the transfer of affected manuka plants, the blight was slow to make a start and by 1949 had spread over only a few acres in the vicinity of the establishment sites.

By 1951, however, it had spread or been spread over about 1 million acres of manuka-infested country of the east coast from about East Cape to Napier and up to 30 miles or more inland. The bug was also introduced to inland Wanganui and in north Taranaki in 1947 and about the same time was established in Northland at several places.

On the east coast and in parts of Northland by 1955 the mealy bug had been as effective in the control of red manuka as it was in Canterbury, but in the higher-rainfall areas of inland west coast districts the spread was very slow and the killing of the manuka appeared to depend very much on the season, the insect being much more severe in dry autumns, which in these areas are relatively infrequent.

It was noted on the east coast, too, that the insect, though very prevalent, was not making a clean kill of all the plants in the higher-rainfall inland areas, especially in thick stands. It was thought that it was only a matter of time before the more resistant plants that continued to show green tips would succumb. Since 1956, however, there has been a definite resurgence of resistance by the manuka to the attack of the mealy bug throughout the North Island, with the exception of the drier parts of the Wairarapa and one or two places in South Auckland.

Throughout Poverty Bay, Wairoa, and Hawke's Bay between 1950 and 1956 the blight had spread everywhere and farmers were sufficiently confident in the effectiveness of the mealy bug to control both seedling and established manuka that they gave up the usual cutting and burning method of controlling seedling manuka invading hill country pastures. In fact they were prepared, and indeed had started,



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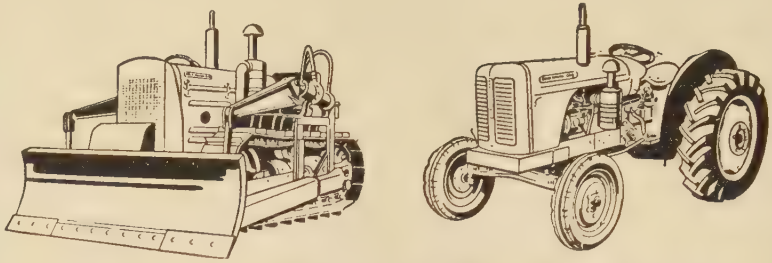

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to take advantage of the killing off of established stands of heavy manuka by aerial oversowing and topdressing, sometimes after burning.

The recent review of the blight position shows that the disease is now insufficiently effective in killing seedlings or cleaning up old stands and the slasher will again have to be resorted to. There is some evidence, however, that in really dry seasons the blight will continue to kill off a lot of plants and will open up established stands to let in sufficient light to warrant oversowing with clovers and topdressing on some areas.

In the Wairarapa the blight, though introduced only in recent years, is still proving quite effective in the drier southern and coastal districts, but in the northern, higher-rainfall areas the position is much the same as in Hawke's Bay.

On the west coast in Wellington and Taranaki Provinces the mealy bug has spread much more slowly from initial sites established in 1948 and 1949, but is now widespread in all districts except south of the Manawatu, where there is not a great deal of manuka, and in some inland areas of south Taranaki, where it has been introduced only recently. Though severely checked in growth and killed in places, the manuka appears to be surviving in the higher-rainfall areas and so far very little advantage has been taken of the results of the spread of the mealy bug.

Auckland Province

First taken to Northland about 1948, the mealy bug is now found throughout the country north of Auckland, except the far northern peninsula beyond Awanui. For a start the insect appeared likely to be as effective in controlling red manuka as it was elsewhere, but in the last two or three years it has become less and less virulent with the result that the opinion is now held that the manuka, though checked in growth, will continue to hold its own.

In some areas dense stands of manuka have been opened up by the loss of leaves and the death of many plants and parts of plants to the extent that sufficient light is let in to allow grasses and clovers to make growth; by the use of heavy cattle to break down and further open up the scrub, areas have been brought back to pasture. It is possible that in the occasional drought seasons in Northland there will be much heavier mortality among the manuka as a result of the weakening effect of the mealy bug.

South of Auckland, through the Waikato and the King Country, and from Raglan and Kawhia across to Thames and the Bay of Plenty the mealy bug has spread extensively in the past five years. There are now few districts where it is not found on practically all the manuka. It is also widespread in the Rotorua-Taupo area. In all the high-rainfall areas and on the colder central pumice lands the mealy bug has not been very effective in cleaning up manuka thickets and it does not look as though it will do so. Seedling growth in these areas is still quite strong, though not as vigorous as it used to be.

The stage at which seedlings were killed on the east coast of the North Island.

In lower-rainfall areas of the Hauraki Plains, Waikato, Raglan, and parts of the Bay of Plenty the blight resulted in the death of a fair amount of manuka in the earlier years of infestation, but it does not appear to be so promising now. Farmers generally contend that the old methods of dealing with the plant will have to continue or be resumed because seedlings are re-establishing freely and most old stands look like surviving. In these areas, too, a really severe drought may help to kill off a lot of the manuka which is definitely weakened by the mealy bug.

Reasons for Failures

The slow spread of the mealy bug in high-rainfall areas of the North Island and the apparent longer resistance of the majority of the plants to attack was at first ascribed to the rainfall and especially to the high intensity of some of the rains which were thought to prevent sufficient build-up of insect populations on the plants to cause their death. It was appreciated that, provided it was not itself effectively controlled by some parasites, the mealy bug could eventually kill the red manuka.

The sudden regrowth of partially killed manuka in 1956 near the site of one of the first introductions in the Wairoa district was investigated by J. M. Hoy, of the Entomology Division of the Department of Scientific and Industrial Research. He found, in addition to one or two insect predators considered to be of no importance in controlling the mealy bug, a form of parasitic fungus active on the mealy bug and a very much reduced population of bugs where this fungus was present. The same parasitic fungus has since been found on mealy bugs in all districts throughout the North Island where red manuka has shown definite ability to survive mealy bug attack.

It is considered, therefore, that partial control of the mealy bug by the parasitic fungus is the major reason for the failure of the bug to give an effective kill of manuka in recent years. The history of this development strongly suggests, however, that high rainfall and high humidity favour the parasitic fungus in its attack on the mealy bug; dry summers and autumns not only favour a marked increase of mealy bugs, but make it more difficult for infested manuka to survive.

Whether the parasitic fungus will also control the mealy bug in the South Island when it reaches there, as it is almost sure to do in time, cannot be established. In the North Island the parasite has certainly upset the high hopes of hill country farmers in their battle against manuka, the major weed of hill country, though the mealy bug is likely to continue to help rather than hinder by killing at least some plants and definitely slowing up growth, especially of seedlings.

Some Control Likely

Unless the parasitic fungus gains the upper hand and more fully controls the mealy bug throughout the country, red manuka is likely to continue to show the effects of attack by its unthrifty appearance and the presence of the common sooty fungus which grows on the honeydew exuded by the mealy bugs and makes the stems and lower leaves of the manuka black. The parasitic fungus which kills the mealy bug is quite a different species from the sooty fungus.

In some of the high-rainfall districts the parasitic fungus appears already to have reached the stage in control where the mealy bug is having little effect on red manuka. Here the sooty fungus has almost disappeared from the plants, because there is little or no honeydew.

Care of Livestock during September

Contributed by the Animal Research Division

CARE OF EWES WITH TWIN LAMBS

For the first month or six weeks of life the lamb depends almost entirely on its mother's milk. Ewes can produce more milk than a single lamb can drink in the early part of lactation, but twins can soon drink all the milk which the ewe can produce. For this reason ewes with twin lambs should be drafted off and grazed together on good paddocks. Separation is most easily done immediately after lambing.

DAIRY COW INFERTILITY

Examine mating records closely, especially during the fourth week of mating, to see if a problem is developing. If it is, it is time to consult your veterinary surgeon. Sterile bulls, mating cows too soon after calving, starvation, and the venereal diseases vibriosis and trichomoniasis are the main known causes of low conception rates.

ROTATIONAL GRAZING OF CALVES

Over 10 years at Ruakura well reared heifers have out-produced their poorly reared mates by an average of 21 lb of fat in the first lactation when both were well fed after calving. Frequent changes to good, clean pasture are essential if calves are to be successfully reared. This rotational grazing avoids deaths in winter, eliminates the need for drenching against worms, and produces yearlings 100 lb heavier than those kept in the one paddock for weeks at a time. Further information on the rearing of dairy stock is contained in Department of Agriculture Bulletin No. 228, "Good Rearing of Dairy Stock".

FEEDING THE MILKING HERD

Autumn-saved pasture is almost equal to high-quality spring pasture as a milk-producing fodder. It should, therefore, be rationed to the milking cows to make it last until spring feed comes away and hardens. An electric fence is essential for efficient utilisation, enabling the pasture to be grazed in small breaks. Unless sufficient reserves of this pasture are available for full feeding, make up the balance of feed with silage. Make sure enough hay is retained to balance the lush spring growth.

When the autumn-saved pasture is finished rotate the herd round the farm. Keep paddocks small enough to maintain a concentration of 20 to 30 cows per acre. If necessary, subdivide larger paddocks with the electric fence. Aim at grazing pasture when it is 4 to 6 in. high, as it is then at its most nutritious stage. Do not keep cows for more than one to two days in the paddock. If necessary, clean up after them with dry stock.

CARE OF PIGS

Late-farrowed spring litters should receive special attention, since these will be approaching weaning age. Creep feeding is the secret of the heavy weaner and best results will be obtained by having a supply of meal and milk always before the litter. Weaned pigs must be well fed, and if meal has been used before weaning, its use should be continued for at least a fortnight to avoid an after-weaning check. The meal ration will be reduced as the skim milk supply increases. It is preferable to feed meal to weaners up to half their daily rations and give the milk saved to the store pigs rather than feed meal to the older pigs at this stage.

After weaning, sows should receive sufficient milk and meal to enable them to regain the weight lost during previous suckling. They should be hand mated, and once safely in-pig may be allowed to subsist on good pasture.

VACCINATION AGAINST SCABBY MOUTH

On farms where scabby mouth occurs each new crop of lambs should be vaccinated; this is most conveniently done at marking. If lambs are not protected, they are liable to suffer a severe check, as the disease makes eating very painful. The vaccine gives very good protection if properly used. Care is necessary to keep the needle prong clear of grease; if it becomes blocked, no vaccine is applied and lambs may still be susceptible. Ewes which have not previously been exposed to the disease should be vaccinated at the same time as their lambs.

EPIDIDYMITIS OF RAMS

Brucella ovis infection (epididymitis) is an important cause of ram wastage. An effective vaccine is now available for use by veterinary surgeons for the protection of rams against this disease. Young rams may be vaccinated at any age from four months until two months before the beginning of their first tupping season. Vaccination as yearlings rather than at an earlier age will give better protection. Older rams should be examined by a veterinary surgeon and rams with clinical lesions of the disease culled from the flock. The remainder of the rams may be vaccinated either immediately or later at any time until two months before the beginning of the next tupping season.

MASTITIS

Mastitis is usually most prevalent in spring. Milk from all quarters should be carefully examined each day in a strip cup. If there is any abnormality, treat the quarter without delay, using three tubes of penicillin cerate at 24-hour intervals. Prompt treatment at this time of the year will greatly reduce loss in production from light or dry quarters.

COCCIDIOSIS IN POULTRY

To prevent coccidiosis in chickens they must be kept growing steadily. Any check is dangerous. Cleanliness is very important, as the disease spreads through the soiling of food by droppings. If an outbreak occurs, sulphamezathine, sulphaquinoxaline, or nitrofurazone should be used in the drinking water or nitrofurazone in the mash. Full particulars of dosages may be obtained from Department of Agriculture Poultry Instructors.

WORMS IN POULTRY

Infestation by round worms is one of the most important causes of poor development of young birds. All growing stock should be treated twice with carbon tetrachloride, once at three months old and again at five months old.

VITAMIN E DEFICIENCY IN CHICKS

The condition in chickens commonly referred to in the past as "X" disease has been shown to be due to a deficiency of vitamin E. This trouble has occurred mainly in the South Island, where New Zealand wheat is used almost exclusively. When the wheat is damaged by weather at harvest and is included in chick rations the chick mash should be supplemented with vitamin E in the form of 5 per cent wheat germ meal or synthetic vitamin E at the level recommended by the manufacturer.

Fodder Crop Production

Seasonal Notes by the Extension Division

EARLY and thorough cultivation, choice of suitable varieties, and control of insect pests in the early stages are all important factors in the production of high-quality fodder crops.

PREPARATION OF LAND FOR FODDER CROPS

WHETHER old pasture is ploughed up for a fodder crop in autumn or spring depends on soil and climatic conditions. In the North Island, where much of the annual cropping is done on light soils and where adequate spring rainfall can be depended on, it is generally done in spring. This allows an extra three to four months' grazing during winter from the old pasture. This feed can be valuable for both sheep and cattle.

The paddock selected for ploughing is often one that has been used as a run-off area for stock on a crop. Hay and silage are also fed out in the paddock. This practice not only increases the fertility of the area to be ploughed, but also reduces the amount of turf to be turned under by ploughing and avoids the poaching of valuable dairy pastures under wet winter conditions.

Ploughing should be carried out as early as possible, as the longer the preparation the better the resulting seedbed. Early ploughing permits soil weathering and rotting of the turf and makes subsequent cultivation easier. Cultivation after ploughing should aim at working up the desired tilth as quickly as possible without undue loss of moisture.

The choice of implements and the amount of cultivation depend entirely on soil conditions. If a soil is worked when it is wet, it becomes harsh, and if it is left too long, working becomes difficult. The ideal seedbed for a fodder crop has a deep tilth, firm underneath but with some rubble left on top. Generally such a seedbed can be produced by careful use of discs, roller, and harrows, the aim being successive pulverisation, consolidation, weed control, and moisture retention.

—*B. A. J. SMITH, Hawera*

* * *

TURNIPS FOR SUMMER FEED

TURNIPS make an excellent supplementary fodder crop for use on sheep and dairy farms during summer. This crop can very often make up the bulk of the ration as summer advances.

White-fleshed varieties are less exacting in their soil type and climatic requirements than the yellow-fleshed varieties and can be used in drier districts and on lighter, poorer types of land.

N.Z. Purple Globe, N.Z. Red Globe, N.Z. Green Globe, and N.Z. York Globe are early varieties. N.Z. York Globe is the quickest maturing.

The seed should be drilled or broadcast into a moist, well consolidated seedbed on land that has been winter ploughed out of pasture. Early establishment is important if the crop is to survive and grow well during summer. Weed competition and depredations by grass-grub beetles, springtails, and cutworms are largely avoided by early sowing.

The most important fertiliser is phosphate. With serpentine, basic, or reverted superphosphate sown at 3 to 4 cwt per acre there is little fear of the germination injury that is possible with straight superphosphate. Seeding rates vary according to the method used—drilled in 7 in. rows 12 to 14 oz per acre, in 14 in. rows 8 to 14 oz per acre, and in 26 in. ridges 5 to 10 oz per acre. When sown broadcast, usually mixed with the fertiliser, slightly heavier rates are recommended.

Turnips are best fed off in "breaks", sufficient for 7 to 10 days' feeding for sheep and sufficient for one-day "breaks" for dairy stock, for which the electric fence is used. Little wastage results from use of these methods. A pasture run-off and/or the provision of good-quality hay are necessary when fattening lambs or cattle on turnips.

To avoid taints in milk products, milking cows should not have free access to turnips. Turnips should be fed only immediately after milking.

—*C. J. CHRISTIE, Palmerston North*

* * *

CROPS FOR PIGS

DECIDING points in selecting a suitable crop for pigs are usually how well the particular crop will do in the locality, how much food or energy value it will produce, and whether it is readily digestible. The highest energy producers are maize, cereals, and peas, followed by such root crops as sugar beet and fodder beet, carrots, swedes, artichokes, and mangels. Other crops grown for pigs are chou moellier, pumpkins, and marrows.

Because the pig has a simple stomach it must be fed non-fibrous foodstuffs of high energy value and the least bulk. A balanced diet is also imperative if it is to thrive.

In dairying districts fodder beet is now one of the main crops grown for pigs. It combines high digestibility and feeding value with excellent keeping qualities into winter, but requires balancing with a protein-rich supplement such as meat or pea meal, skim milk, or buttermilk powder. Carrots are less popular because of the hand work usually needed to grow a good crop.

Annual weeds are the arch-enemy of all cropping. Results with pre-emergence sprays such as TCA on fodder beet have been variable; clean, well worked land is by far preferable to the chemical approach to weed control. Kerosene on carrots has proved extremely useful in killing weeds, but is costly.

Rex, or to give it its full name, Pajbjerg Rex, is the most popular fodder beet variety grown for pig feeding. It is seeded at 4 lb per acre in 28 in. drills and sown with equal parts of reverted superphosphate and blood and bone at 5 cwt per acre. Later, when the plants are well established but before bulbing, a side dressing of 1 cwt per acre of sulphate of ammonia can prove worth while. The crop is pulled and fed out with the tops as required.

—*D. M. E. MERRY, Pukekohe*

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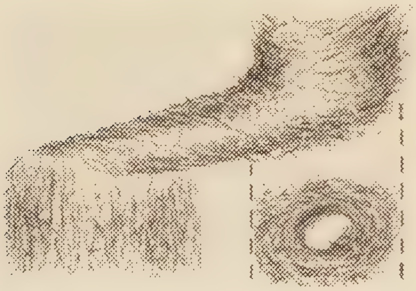

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Dwarf Apple Trees

MOST home gardeners wish to grow some apple trees, but where the garden is small the large size to which most apple trees grow has always posed a problem. However, the introduction of dwarfing rootstocks has made it possible to grow a number of trees in a small garden. They may be grown as pyramids, bush trees, or cordons and can be conveniently grown along the edge of the vegetable garden without encroaching on the garden area.

By G. F. THIELE,
Instructor in Horticulture,
Department of Agriculture,
Christchurch

THE dwarfing rootstock commonly used for apples is the Malling IX. Unfortunately the roots of this stock are very brittle and it is necessary to stake trees on this stock whenever they are exposed to wind.

A more recent stock, Malling-Merton 106, is a promising dwarfing stock which has a better rooting system than M.IX.

Some of the advantages of growing apples on Malling IX rootstock are:

1. It produces a true dwarf tree which usually grows only 6 to 8 ft high.

2. Each tree should eventually produce up to a bushel of fruit, and with careful attention even more.

3. The dwarfing characteristic applies solely to tree size. Fruit grown on dwarf trees is the same size as that on normal trees.

4. Trees on dwarfing stock will produce fruit at an earlier age, in fact a few fruits in the second year, and be in full production at five to six years old.

5. Instead of having one large tree producing more fruit than can be used in a short period, it is possible to grow five or six dwarf trees of different varieties in the same area, giving a supply of fruit throughout the season.

All varieties of apples can be propagated on M.IX stock, but as with the more vigorous stocks differences in vigour occur between varieties. For instance, Gravenstein will exhibit more than average vigour and needs careful treatment to keep it to a reasonable size, whereas Sturmer tends to have insufficient vigour.

There are three main systems of training trees on M.IX. They are:

1. As bush trees.
2. As pyramids.
3. As cordons.

Bush trees and pyramids may be grown as single specimens or in rows at 5 to 6 ft apart in the row for bush trees and 4 to 5 ft apart for pyramids.

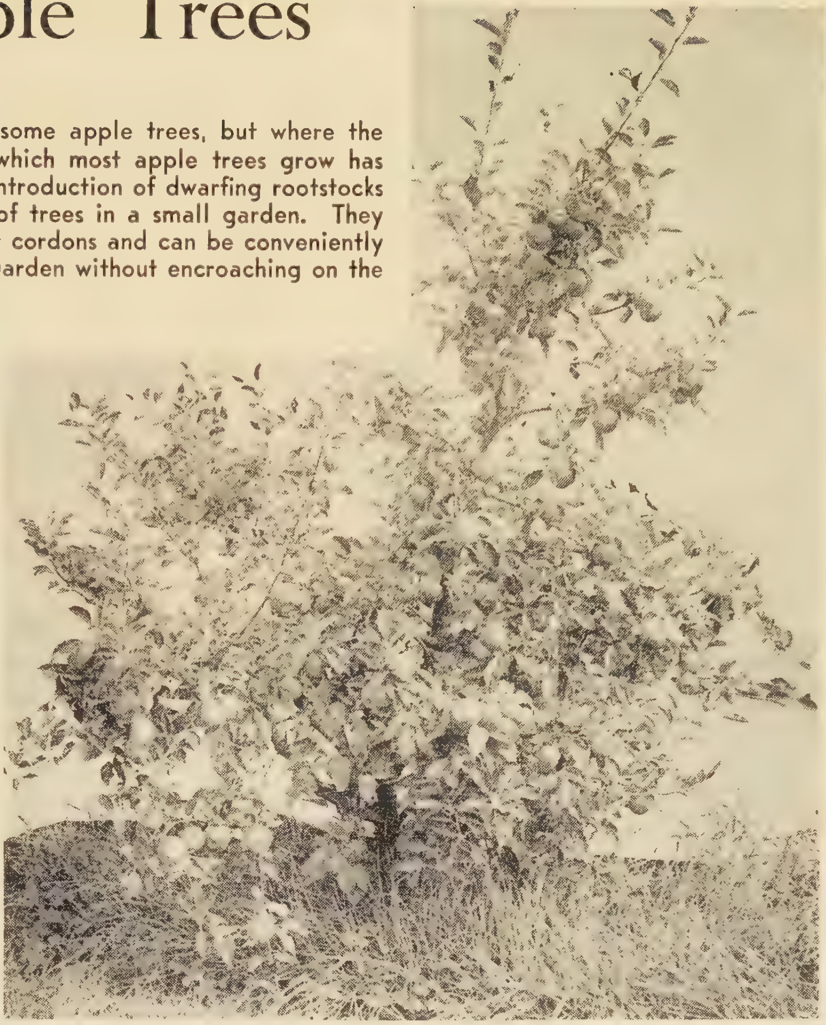
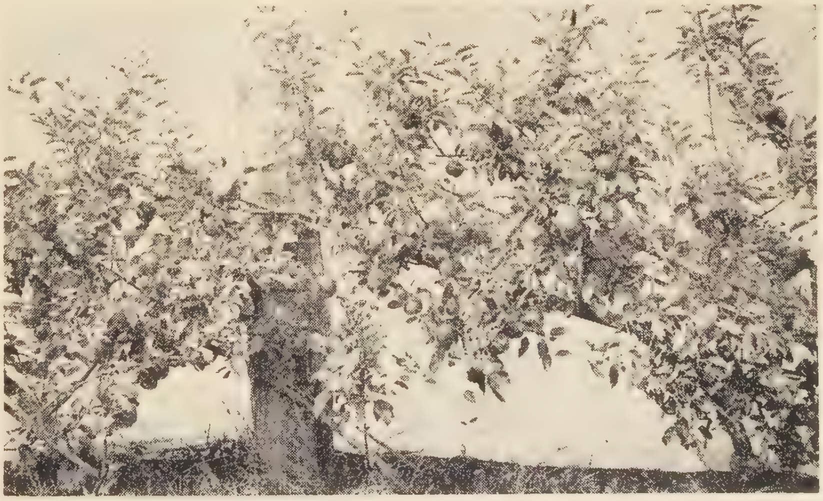


Fig. 1—Mature apple tree on Malling IX stock trained on the pyramid system. The tree is 6 ft high and is carrying more than a bushel of fruit.

Fig. 2—Dwarf apples in full production trained on the modified cordon system.



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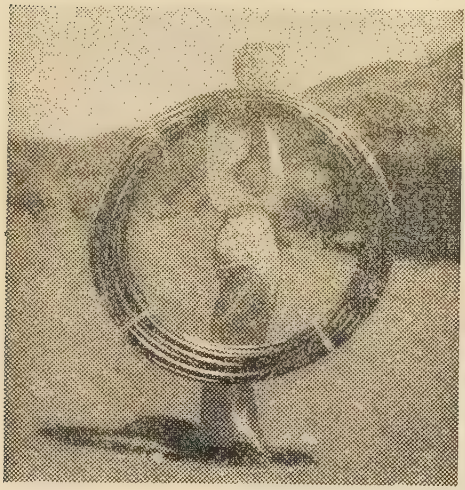

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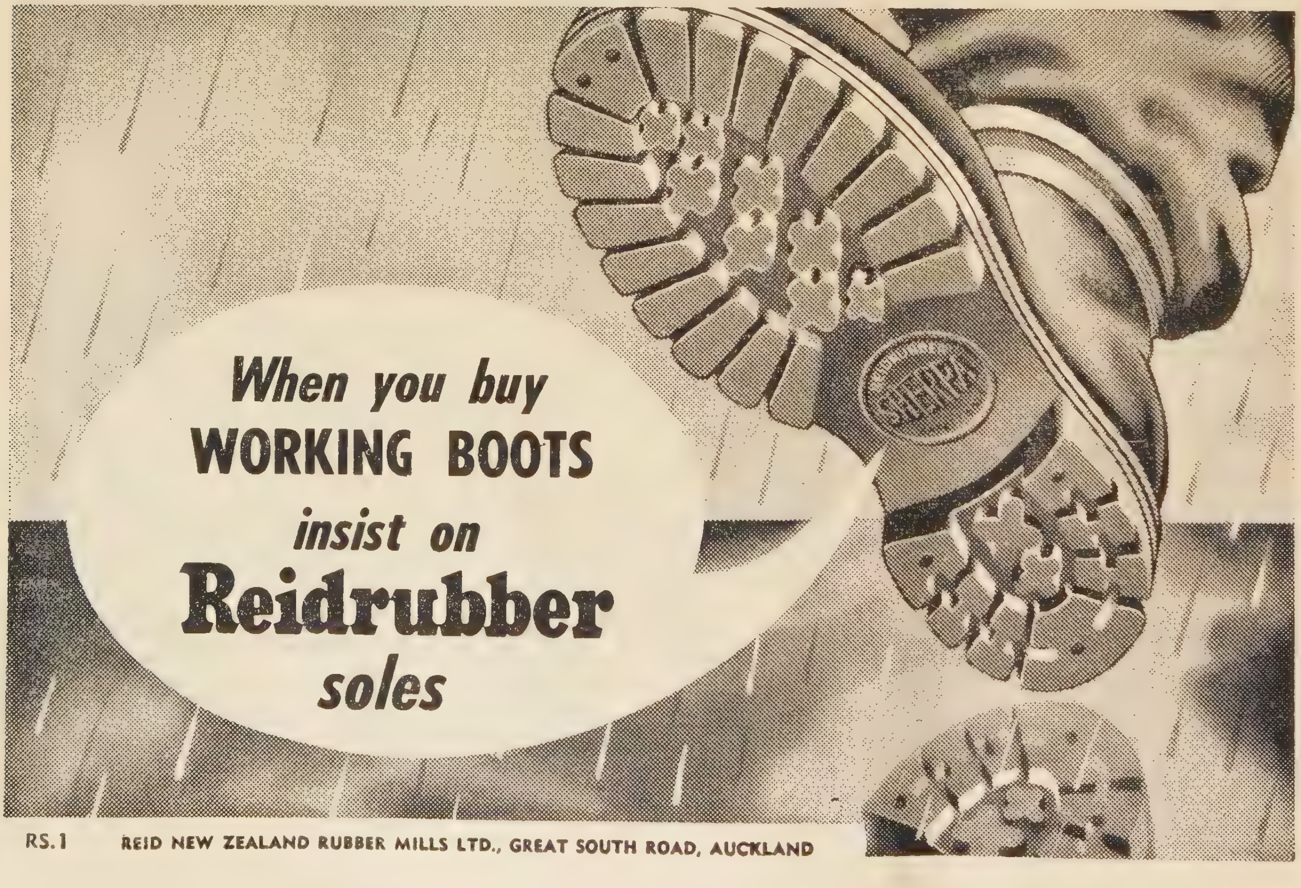

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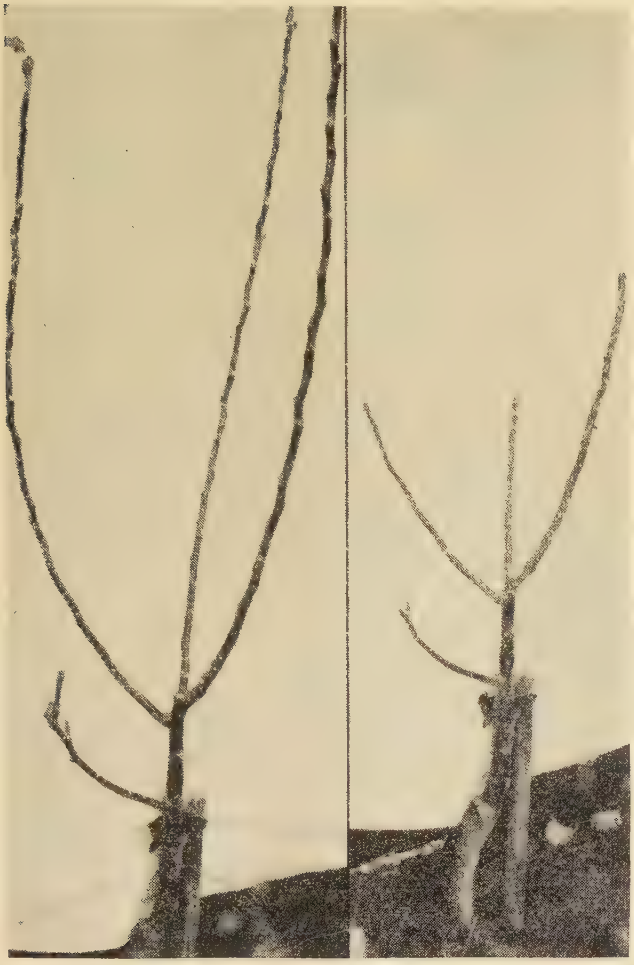
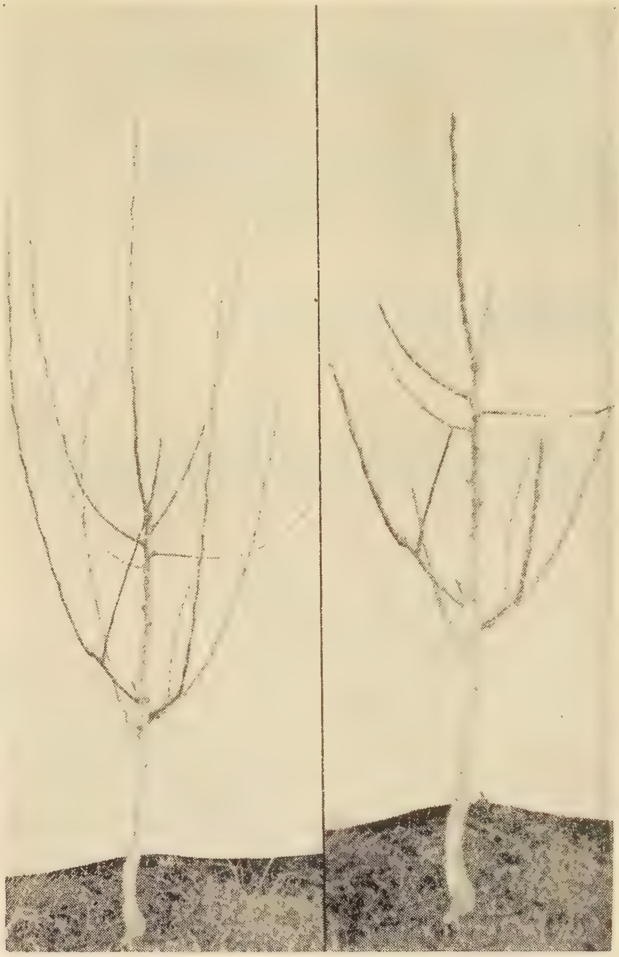
PRUNING OF APPLE TREES ON PYRAMID SYSTEM





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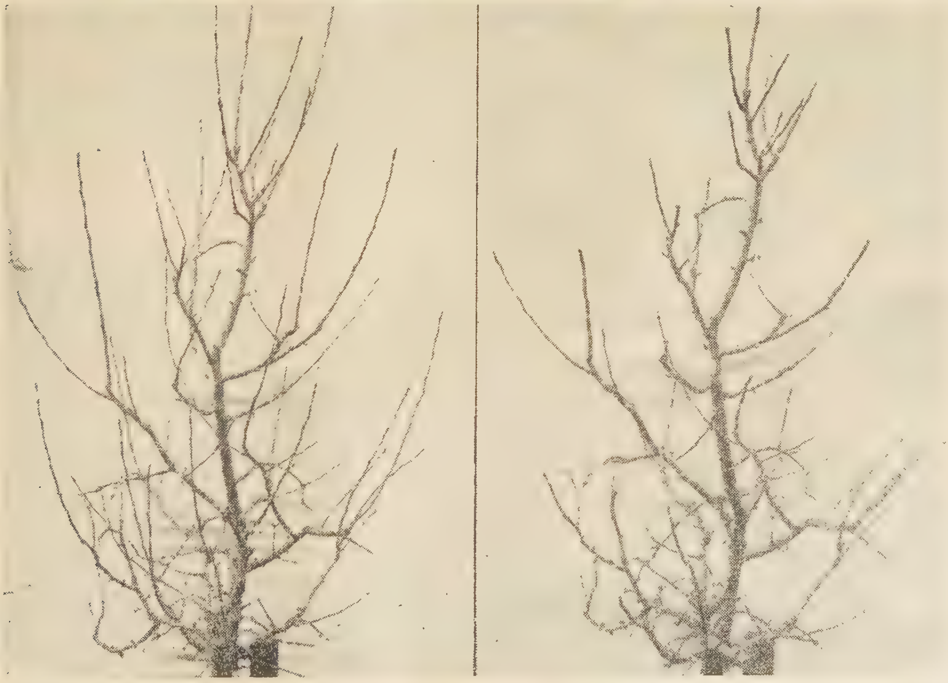

Figs. 3 and 4 (upper left) — Two-year-old apple tree before and after pruning on the pyramid system.

Figs. 5 and 6 (upper right) — Three-year-old apple tree before and after pruning on the pyramid system.

Figs. 7 and 8 (left)—A mature apple tree before and after pruning on the pyramid system.

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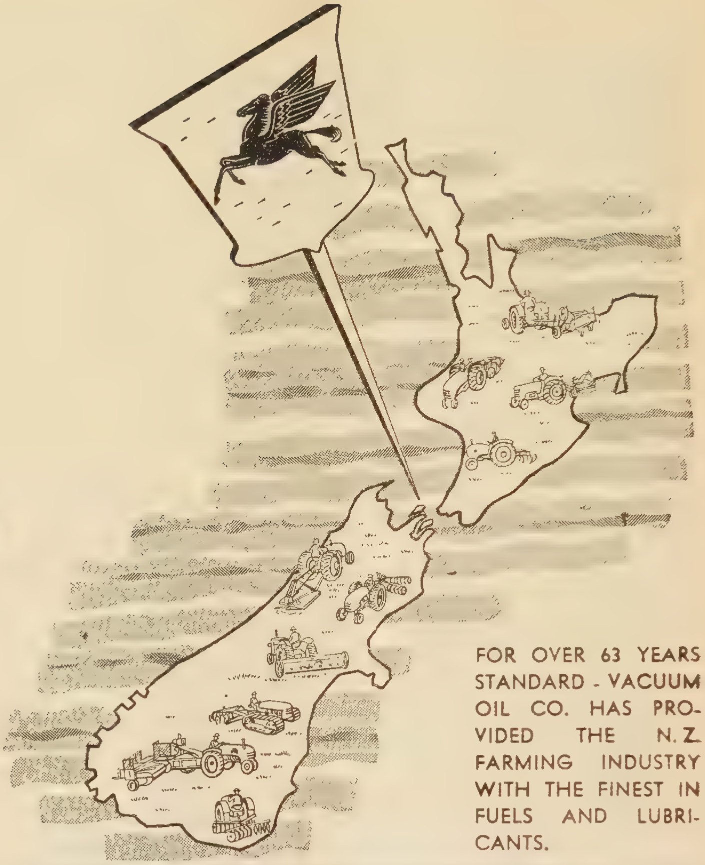

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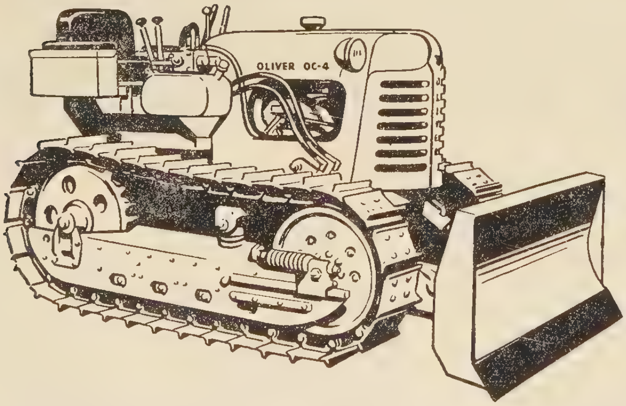

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The cordon system is shown in Fig. 2. This system requires a fence or other suitable type of support.

The oblique cordon, as shown in the illustration, has proved more satisfactory than the upright cordon both in cropping and ease of training. The well trained cordon can provide a most attractive boundary to the vegetable garden, where space might be wasted with a bordering hedge.

In the cordon system the trees are planted about 18 to 24 in. apart. The cordon has the advantage that a greater number of varieties can be grown in a given length of row, because of the closer spacing, than with either pyramids or bush trees. A disadvantage is the initial cost of the greater number of trees.

Dwarf trees are not sufficiently vigorous for espaliers and this system will not be described in this article.

PLANTING

Basically, the planting of a tree on dwarf stock does not differ from the method used with any other fruit tree. The best time for planting is late autumn, but any time during the dormant period is satisfactory. It is essential when planting a dwarf tree to be certain that the point of union between stock and scion is at least 3 to preferably 6 in. above ground level. This eliminates any possibility of the lower part of the scion coming in contact with the soil, as the scion is liable to produce roots of its own. If this does happen, the effect of the dwarfing rootstock will be lost and the tree will grow more vigorously.

Staking

As the roots of M.IX are extremely brittle and liable to break under stress it is essential to stake those trees to be trained on the bush or pyramid system. Trees on the cordon system will be supported by tying to the fence.

The method of staking is shown in several of the illustrations. The stake should be driven at least 18 in. to 2 ft into the ground at the time of planting and should be as close to the trunk as possible.

If staking is delayed until some time after planting, the roots are liable to be damaged in the process. The stake should protrude to a point 6 to 12 in. above the union between rootstock and scion. At least below ground the stake should be coated with a protecting material, such as creosote or oil, to prevent rotting. Hardwood or metal stakes are preferable. Hessian or rubber is satisfactory to tie the tree to the stake, but wire or twine should not be used directly against the tree, as it will be liable to bite into the bark and restrict the flow of sap.

TRAINING AND PRUNING

The three main methods of training dwarf apples are the bush, pyramid, and cordon systems.

Dwarf Bush System

The bush method is almost the same as is used for all large fruit trees. It consists of training 3 or 4 leaders outward from the centre to form a "vase"-shaped tree with an open centre. This is the easiest system for the average home gardener, but it has several disadvantages for dwarf trees.

1. It is not suitable for the weaker growing varieties such as Sturmer and Granny Smith.

2. The bush tree will take up slightly more space than the pyramid tree.

3. If a bush tree is allowed to carry as heavy a crop as a pyramid tree of the same age, the branches of the bush tree will have to be propped when the fruit develops to prevent the branches from breaking.

4. The bush tree does not normally produce as heavy a crop as the pyramid.

The principles of training of the bush type of tree are the same as for a normal sized standard tree.

Dwarf Pyramid System

Though the training of a tree to the pyramid style may seem more difficult at first, it is proposed to deal fully with it so that home gardeners may follow this method, which is more generally recommended for dwarf trees.

One central leader is trained as near to the vertical as possible, with almost horizontal fruiting laterals or branches radiating from this central leader at regular intervals.

It is always best to start with a tree only one year from budding, which should merely be a straight unbranched whip.

In forming the pyramid tree the principle to be borne in mind is that the sap always flows to the highest point, so that the highest bud on the tree will normally grow the most. This is contrary to the commonly held belief that the harder a shoot is cut the more will it grow in every case.

Winter Pruning

The following section deals with winter pruning only. Summer pruning will be covered in a separate section.

Season one: After planting, cut the whip back to a bud 18 to 20 in. above ground level. Three or four strong growing shoots will arise below this cut during the next growing season (Fig. 3). Many shops sell trees at this two-year-old stage, in which case the pruning method can be started from season two.

Season two: The same tree is shown in Fig. 4 after pruning. The shoot nearest to the vertical (invariably the top shoot) should be selected as the one to continue as the central leader. Depending on its length this should be shortened by about half its length or to not more than 12 in. to the bud which is most likely to produce a vertical shoot. All other shoots should be treated as potential fruiting laterals and shortened to a length of 6 to 8 in. to a bud on the underside. Any short shoots as shown low down in the illustration can be left uncut and may produce a fruit or two the next season. Any such shoots are not important to the training of the tree and will usually be removed during the next season's pruning. Fig. 5 shows the growth made by a typical dwarf pyramid three years from budding.

Season three: Fig. 6 shows the same three-year-old tree after pruning. Cutting the central leader to an inside bud last season has produced a growth nearly vertical. This has again been shortened to about half its length to a bud which will again produce growth in a vertical direction. The other two or three laterals produced from last season's cut have been shortened back to 6 to 8 in. to underside buds to form a second tier of fruiting branches. The first tier of laterals has also produced further growth and has now formed fruit buds on the two-year-old wood. The growth produced last season should be shortened to 8 to 10 in., and any small growth not of this length can be left uncut to develop fruit buds. Some new growth in this first tier may need to be removed completely if lateral production has been excessive. The illustration shows how only two new laterals have been retained on each branch along with two or three short uncut laterals. If too many laterals are retained at this stage, the tree is liable to become overcrowded. Fruiting branches are not necessarily produced evenly about the central leader. There is no satisfactory method of controlling this, but as more young laterals are added and, provided the central leader is in fact kept in the centre, the tree will naturally become balanced.

Season four: Again the new leader growth is treated similarly, a central leader being continued and a third tier of laterals developed. The second tier of laterals will be treated in the same way as the first tier was in season three. The first tier by this time will have extended further, and new growth will again be shortened to 6 to 8 in., and any excess growth which is crowding or crossing over other laterals should be cut out completely. The tendency at this stage should be to remove the vigorous upright-growing laterals on the lower fruiting branches and retain laterals tending toward the horizontal. The principle behind this is that laterals

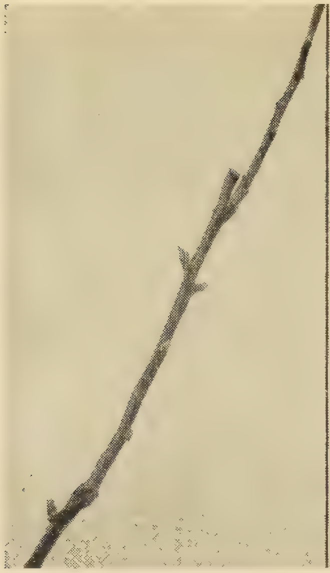


Fig. 9—Shoot showing summer pruning cut and subsequent growth that season.

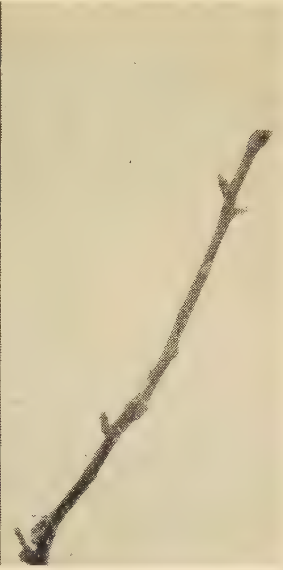


Fig. 10—Winter pruning of the shoot shown in Fig. 9.

nearer the horizontal initiate fruit buds more readily than vertical growth.

Season five onward: Figs. 7 and 8 show a mature tree before and after pruning. The same principle is still applied at the top of the tree, even though growth is now reduced as the crop increases and the tree assumes its dwarf habit. The fruiting branches are still being extended. It is a matter now of retaining this framework of the central leader with its radiating fruiting branches and encouraging the continual production of new fruiting wood each season.

As new fruiting wood is produced, four- or five-year-old fruiting wood can be replaced. This is called the renewal system, whereby better fruit is produced on younger wood close to the main framework of the tree. The renewal of older wood should not all be done at once, but should be carried out continuously, but to a limited extent each season. Notice in the pruning of the older tree (Fig 8) the number of short laterals which have been left uncut. To the amateur this may give an untidy and only half-pruned appearance, but there is no need to cut all the laterals. Laterals left uncut will normally initiate fruit buds more readily than those which are cut. This principle applies to all pip fruit pruning, not necessarily those on dwarf stock.

One final point about pruning which applies equally to dwarf and to larger trees. There are some varieties of apples which bear their fruit mainly on the tips of one-year-old laterals rather than on two-year or older wood as is generally the case. Notable among these are Irish Peach, Rome Beauty, and Frimley Beauty. It is necessary with these varieties to retain more uncut laterals to produce a good crop and to replace these laterals continually after they have fruited. Any tendency toward production of fruiting spurs with these varieties should be encouraged.

Summer Pruning

Summer pruning is somewhat controversial.

Fruit bud initiation for the following year has taken place before January, when summer pruning is normally carried out. Summer pruning does not increase the crop for the following year; it merely reduces the vigour and ultimate size of the tree and leads to the formation of a **true dwarf tree** both in size and shape.

If there is room in the garden for a slightly larger tree, there is generally no need to summer prune; in fact, summer pruning will produce a smaller tree, which will normally produce correspondingly smaller crops. Then, too, there is no need to summer prune the weaker growing varieties, such as Sturmer, in fact it is a disadvantage.

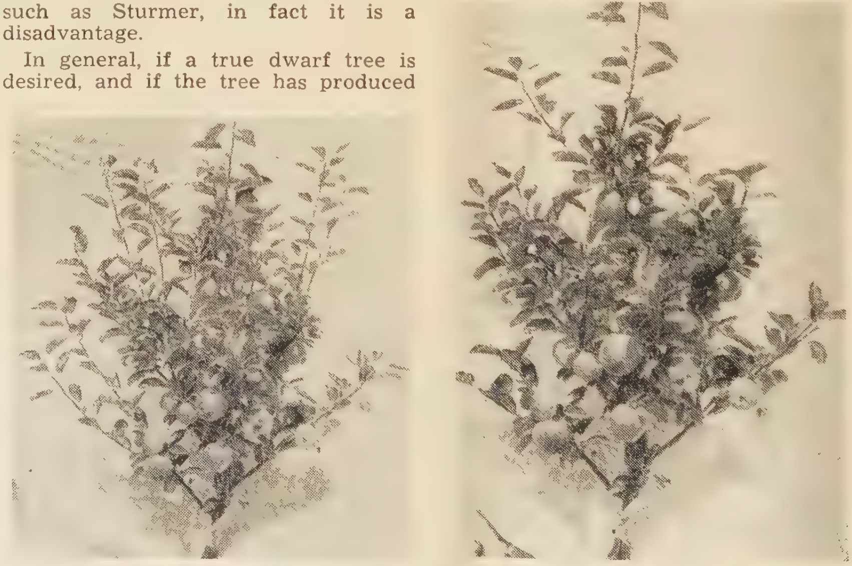
In general, if a true dwarf tree is desired, and if the tree has produced more than 12 in. of new growth by January, it will pay to prune all new laterals back to five leaves, always to an underside bud. However, the central leader and top tier of young laterals should never be cut back in summer. Where shoots are summer pruned at the correct time in January they will make very little further growth that season, but any growth that they do make should be removed next winter back to the point where the cut was made during summer (Figs. 9 and 10). Fig. 9 shows the cut made during summer and the subsequent growth that season. Fig. 10 shows the same lateral as pruned the following winter.

Figs. 11 and 12 show the same tree before and after summer pruning. The new growth at the top of the tree has not been touched and shorter laterals on the rest of the tree have also been left unpruned.

Summer pruning is merely a means of reducing vigour and tree size. In reducing vigour it does tend to give a more open tree and results in more highly coloured fruit. Summer pruning also allows the tree to be trained into a more definite pyramid shape, as it is in Fig. 13, compared with the mature tree carrying a heavy crop in Fig. 1. The tree in Fig. 1 has not been summer pruned at any stage.

Cordon System

The cordons illustrated in Fig. 2 have been planted at an angle of 45 degrees and are supported by bamboo rods attached to a post and wire fence. Posts should be 10 ft apart and protrude 5 to 6 ft above ground level. Bamboo rods 6 to 8 ft long are tied to the fence at the required angle and 18 in. to 24 in. apart, depending on the distance between trees. Each cordon as it grows is tied at intervals to the bamboo with soft string. When the



Figs. 11 and 12—A three-year-old dwarf tree before and after summer pruning.

cordons reach the top of the fence they can be detached from the fence, lowered to a more acute angle, and retied. This will allow further extension of each cordon.

Pruning

Season one: Once again the ideal is to start with a one-year-old unbranched whip. It is then not necessary to do any pruning at all the first season. The object is for trees to have a single leader with the fruit borne on short side shoots or spurs. Any shortening then of the main leader will produce three or four new growths rather than a single straight stem. If there are any side shoots present when the trees are planted, these should be shortened to about three good buds.

During the first growing season the new growth from the top of the leader should be trained along the bamboo rod. Any side shoots which have grown to 9 to 12 in. by January and have a stiff woody base, indicating maturity, should be summer pruned back to four or five good buds. Any subsequent growth from these cuts should be removed during pruning the next winter.

Season two: Again the single leader is not shortened. With cordon training the leader is seldom shortened until it has reached the top of the fence or when further extension is not required.

The only occasions when shortening of the leader is advocated are:

(a) When the tree is not producing sufficient side shoots. The leader should then be shortened by up to a third of the length of new growth.

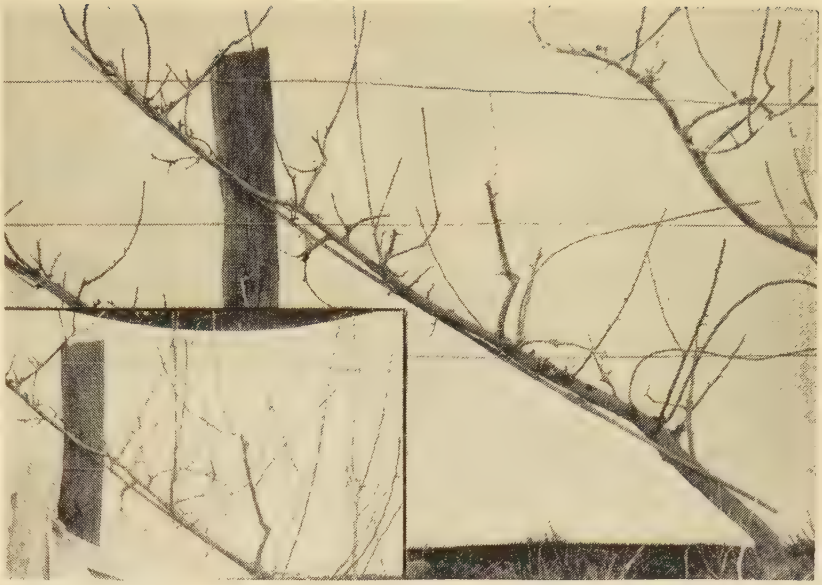
(b) With the weaker growing varieties when they produce a fruit bud at the terminal of the leader—the leader should be shortened by 1 or 2 in.

New shoots arising from the main stem are again summer pruned in January back to four or five buds. New growth arising from existing side shoots or spurs should be cut back at the same time to one or two buds.

The third winter pruning is again the same as the previous season. Any extension of growth from the summer cuts should be removed as well as excess growth which is tending to crowd or cross over the main fruiting spurs. Any growth which was not long enough to be summer pruned but which is required for fruiting should also be shortened at this stage to three or four buds.

Subsequent pruning will be on similar lines. The only variation will be when fruiting spurs eventually get too long and old and fruit becomes small and of poor quality.

The spurs must then be replaced by cutting back to the main leader and encouraging the development of a new shoot and eventually a young fruiting spur.



[*Watt*

Figs. 13 (inset) and 14—Cordons before and after winter pruning on the lateral renewal system.

Figs. 13 and 14 show a different type of pruning for cordons (Fig. 13 before pruning, Fig. 14 after pruning).

This system will produce more good fruit, but is difficult for the average home gardener to manage, unless he has a detailed knowledge of pruning.

Instead of producing fruit on spurs as with the other method described, fruit is produced on laterals which are renewed every 3 or 4 years as they become too long and interfere with the next cordon. This method does not involve summer pruning. All pruning is carried out during the winter months.

Fig. 14 shows a number of young shoots left unpruned to develop fruit buds. The next season these must be cut back into what will then be two-year-old wood and is commonly known as cutting back to fruit. If laterals are left uncut for more than a year, they may become bare of buds toward the base and bear only a small amount of fruit at the tip.

At the top of the cordon in Fig. 14 a one-year-old lateral has been bent and held in that position. If it had been left upright, it would have been one of the tallest shoots and would have grown vigorously. It has now been brought nearer the horizontal, where it will develop fruit buds more readily.

As the cordon has now reached the desired height, fruiting at this point will be valuable in helping to decrease the amount of growth. There is a similar example near the bottom of the cordon where an upright shoot has been tucked under the wire to bring it nearer to the horizontal.

As a rule cordons trained on this system generally appear more crowded and perhaps unruly during the growing season. Cordons shown in Fig. 2 have been trained on this system, but heavy crops are well distributed over the trees.

MANURING AND MULCHING

To secure best results the trees should be well manured each season with a mixed fertiliser as for normal trees. A suitable mixture (parts by weight) is sulphate of ammonia 1, dried blood 1, superphosphate 2, and sulphate or muriate of potash 1.

Annual dressings should be varied according to the vigour of a tree and its age. From ½ to 1 lb of the above mixture can be given to young trees, increasing to 1½ or 2 lb for mature trees. Naturally weak varieties should benefit from an increased ratio of nitrogen.

A mulch of hay or straw round each tree or along the row 3 or 4 in. deep will be beneficial.

OTHER DWARF FRUIT TREES

Only dwarf apple trees have been dealt with because other fruits are not available on a **true** dwarfing rootstock. However, pear varieties are available on quince stock which will produce a semi-dwarf tree usually not more than 10 to 12 ft high.

Dwarf stone fruit trees are still experimental. Work on *Prunus besseyi* as a rootstock has indicated that it will limit most stone fruit varieties to about half their normal size.

There are many home gardens where dwarf trees could be used to greater advantage than the normal-sized trees, as they take up much less room, cause less shading, and provide more variety in a small area.

◆

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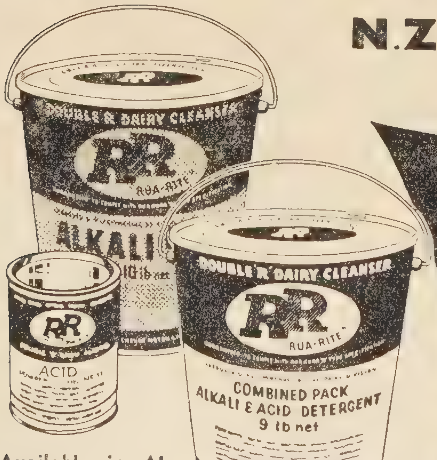

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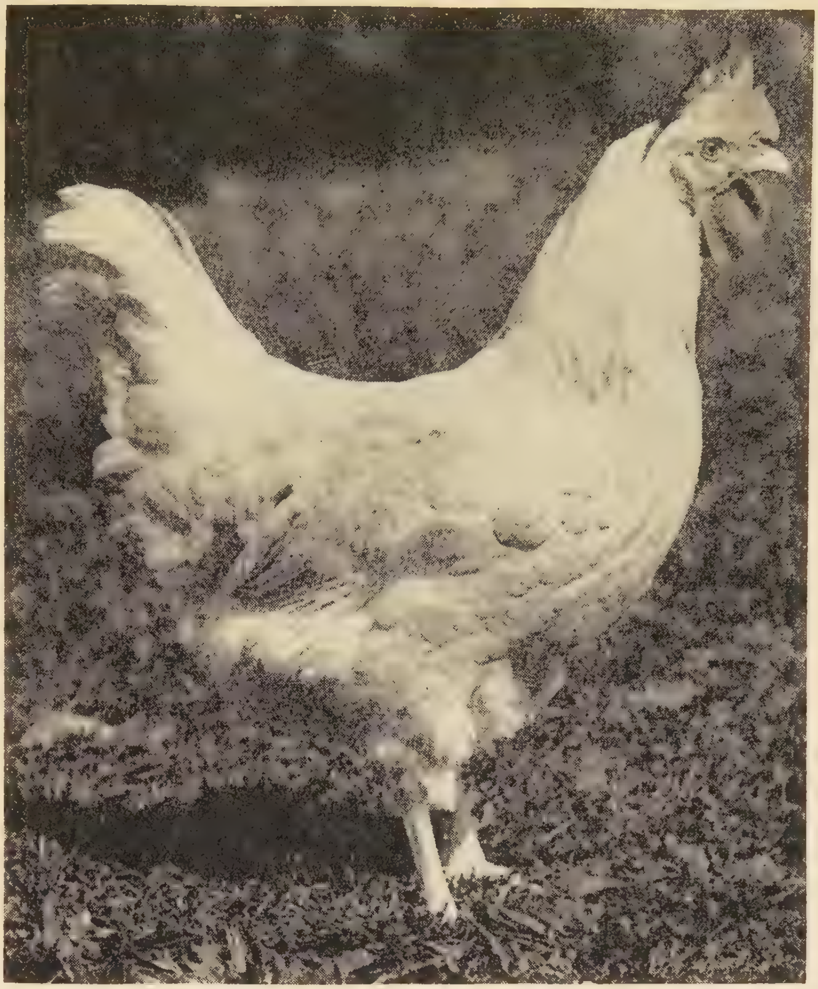
Trial Shows that High-energy Poultry Mashes Give Better Returns than Cheaper Mixtures

COST of poultry mash per ton is a misleading assessment of its value. True economic efficiency is best measured in terms of actual performance, that is, the cost of food to produce a dozen eggs. This cost is the primary measurement adopted for interpreting results in a feeding trial at the Department of Agriculture's Poultry Demonstration Plant designed to assess the value of high-energy laying mashes. Information from this trial is given here by J. Edmondson, Poultry Experimentalist, Department of Agriculture, Upper Hutt, and results are compared with those of similar trials conducted a year earlier.



A White Leghorn x Australorp pullet typical of the 240 used for the feeding experiment described in this article.

FEEDING trial results reported in the June 1958 issue of the "Journal" demonstrated that replacement of low-energy food such as bran and pollard by high-energy grains such as wheat or maize resulted in a more economically efficient mash. Though the cost per ton was increased, the amount of food and cost of food required to produce a dozen eggs were significantly less.

Where a ration is correctly balanced for vitamins, minerals, and protein the amount of food required by a laying flock will depend on the number of calories in each pound of food. The more calories there are the less food will be needed to meet the energy requirements of the layer.

It has been a common practice to recommend a level of protein in the diet as a percentage of the diet. Where this is applied birds on a high-energy mash will, because they eat less food, receive correspondingly less protein. The conclusion, therefore, would be that with a mash of higher energy value a higher level of protein would be needed to ensure an adequate supply to the laying bird.

The test referred to above indicated that 17 per cent of crude protein in the diet resulted in a rather more economically efficient diet than a ration containing 15 per cent of protein, which is the level more commonly recommended. The difference was not very significant but was sufficient to warrant a further test.

A feeding trial was therefore begun in mid February 1958 with the following objectives:

1. To compare rations of the higher-energy type varying only in protein levels (17 per cent and 15 per cent respectively).

2. To compare the mashes referred to in 1, which are mixed at the Poultry Demonstration Plant, with a purchased standard layers' mash No. 1. According to information available this mash would be regarded as a low-energy mash containing about 40 per cent of pollard and bran combined. The normal practice of fortifying this mash with vitamins A and D_3 and dehydrated lucerne meal was adopted.

Method

The trial was begun in mid February, when the pullets were at the point of lay, and continued for 40 weeks. A daily record of egg production was kept and food consumption was measured once every 4 weeks.

White Leghorn x Australorp pullets bred from the farm flock were used. They had been hatched at the same time and reared intensively from day old. They were divided at random into two flocks of 40 each and housed intensively in similar pens throughout

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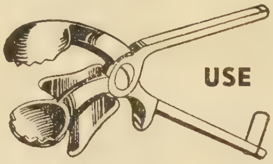

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To emphasise the danger of undue interference by unqualified workers and to advise on what farmers can do to lessen the suffering and save the lives of valuable animals, the Department of Agriculture has published a new bulletin, No. 394, "Safer, Easier Calving and Lambing".

The bulletin describes the equipment required for both calving and lambing difficulties, stresses the importance of cleanliness at all stages, indicates the stage when animals will require assistance, and describes the stages preceding birth when examination is advisable to detect complications.

The section on calving describes the procedure needed to deal with normal presentations, and gives step-by-step descriptions of methods to overcome the complications arising from abnormal presentations, eight of which are illustrated.

The bulletin can be obtained for 1s. a copy at all main offices of the Department of Agriculture.

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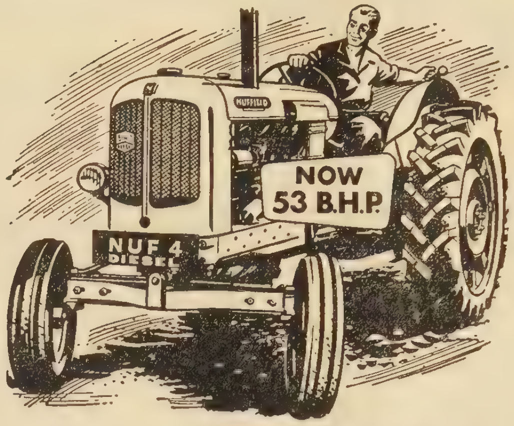

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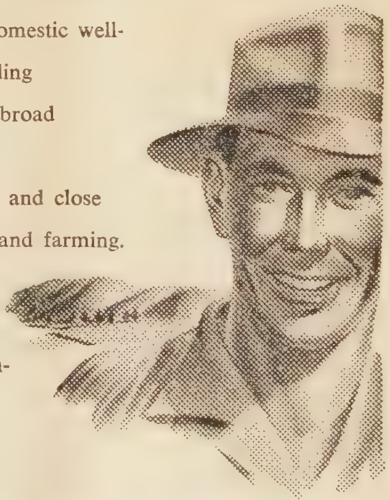

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the trial. Thus there were 80 pullets used to test each group. The groups were fed the following rations:

Group 1: High-energy mash, high protein (17 per cent).

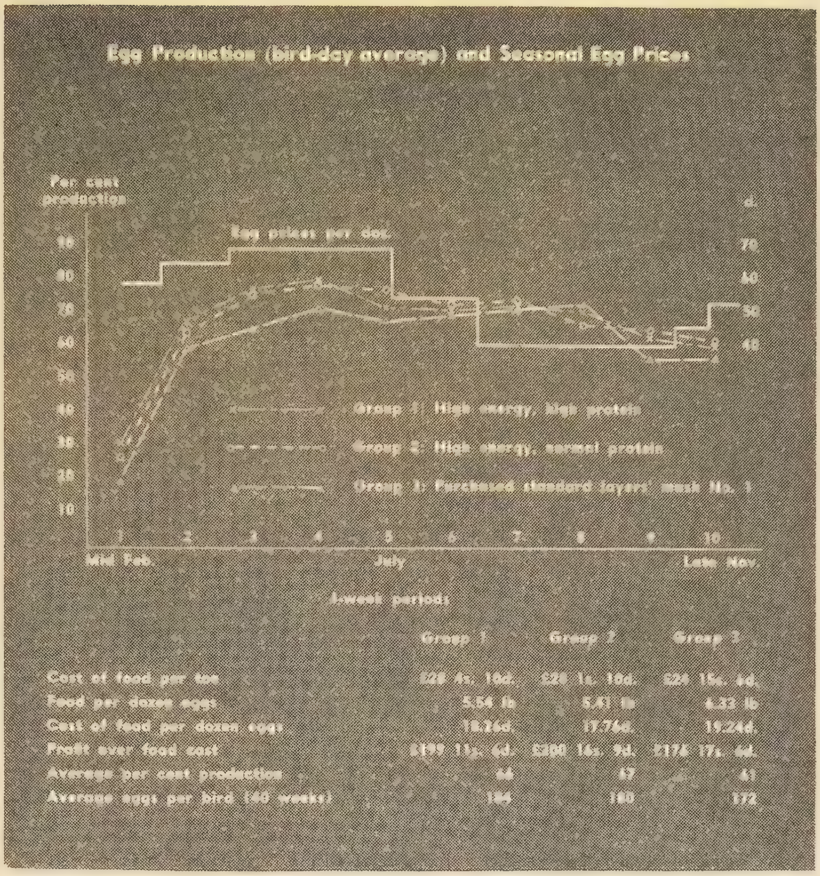
Group 2: High-energy mash, normal protein (15 per cent).

Group 3: Standard layers' mash No. 1 plus vitamins A and D_3 and lucerne meal.

The mash ingredients were as follows:

	Group 1 lb	Group 2 lb	Group 3
Bran	100	100	Bought standard layers' mash No. 1
Pollard	60	60	
Ground wheat ..	900	1,040	
Ground maize ..	300	300	
Meat meal (60 per cent)	440	300	
Oyster shell dust	40	40	
Dehydrated lucerne meal	140	140	7 per cent
Manganese sulphate	½	½	
Salt	20	20	
Vitamins A and D_3	Requisite dosage		
	2,000½	2,000½	
Protein (per cent)	21½	17½	16

The mashes were fed dry in hoppers and were available to the birds at all times. Oyster shell and hard grit were provided ad lib. and a strictly controlled ration of whole wheat (1¾ oz per bird per day) was fed as a scratch feed in the litter each afternoon. The effect of feeding whole wheat in addition to mash resulted in estimated protein levels of 17 per cent, 15 per cent, and 14 per cent of total food eaten by Groups 1, 2, and 3 respectively.



	Group 1	Group 2	Group 3
Cost of food per ton	£28 4s. 10d.	£28 1s. 10d.	£26 15s. 6d.
Food per dozen eggs	5.54 lb	5.41 lb	6.32 lb
Cost of food per dozen eggs	18.26d.	17.76d.	19.24d.
Profit over food cost	£199 11s. 6d.	£200 16s. 9d.	£174 17s. 6d.
Average per cent production	66	67	61
Average eggs per bird (40 weeks)	184	188	172

Costing of Mashes

Costing of mashes was based on an estimate of the average ruling prices of ingredients. Prices did not include any charge for mixing or transport to the farm. As such charges are common to all groups, they do not influence comparisons made between groups in this experiment.

Results of Trial

Results of the feeding trial are given in the graph and table at right above.

Egg Production

The graph shows rate of production from the onset of lay for 40 weeks. Egg production for all groups was satisfactory, but Group 3, receiving the standard layers' mash No. 1, laid at a lower rate during winter. Seasonal egg prices are also shown on the graph, as they illustrate that lowered winter production can markedly reduce the income from total egg production.

There was no appreciable difference in the productivity of Groups 1 and 2, indicating that the higher level of protein in the mash fed to Group 1 did not have any noticeable beneficial effect. A level of 15 per cent of protein in the diet therefore appears adequate for egg production with this type of ration.

Food-conversion Efficiency

Groups 1 and 2 showed practically the same efficiency in converting food to eggs, but Group 3 required about 1 lb more mash (standard layers' mash No. 1) per dozen eggs laid.

Economic Efficiency

"Economic efficiency" is calculated as the cost of food consumed to produce a dozen eggs. Though the purchased standard layers' mash No. 1 (Group 3) was much cheaper per ton to buy than the two mashes fed to Groups 1 and 2, it was more expensive to feed because of the higher rate at which it was consumed.

Group 2 (receiving the same mash as Group 1 except for 15 per cent of protein against 17 per cent) was slightly more efficient than Group 1 at 17.76d. for food per dozen eggs compared with 18.26d. This difference could not be regarded as significant, but it demonstrated clearly that with a ration of the type tested (one of fairly high calorific value) it was not necessary to increase the protein content.

Profit over Food Cost

Figures shown in the table represent profit over food cost for groups of 80 birds. There was no appreciable difference between Groups 1 and 2, but the return from Group 3 (fed standard layers' mash No. 1) was over 5s. less per bird.

Conclusions

1. When rations of the higher-energy type (consisting mainly of ground grains and only a small percentage of bran and pollard) are used there is no advantage in increasing the protein level of the diet beyond 15 per cent.

2. Low-energy mash (containing a large proportion of bran and pollard) was cheaper to buy than farm-prepared high-energy mash, but birds ate more of it and this made the cost of food per dozen eggs higher than with the more expensive, high-energy mash. There was also a tendency for winter egg production to be lower with the low-energy mash.

Arrangement of Tile Drainpipes to Divert Spring into Drainage System

By K. L. MAYO,
Instructor in Agriculture (Field Drainage), Department of Agriculture,
Palmerston North

SPRINGS encountered during the drainage of land are often difficult to control or "tap". The idea of course is to lead them into a tile drain. It is not difficult to install a tile drain to within a few feet of them, but just what should be done at the actual spring is always a problem. No two springs are exactly the same and the method used in their control must therefore vary to suit individual differences. However, the following system can be applied to a type of spring common in some districts and can be modified to suit each spring within this type.

INSTALL a tile drain at a depth of 2 ft 6 in. to 2 ft 9 in. to within a few feet of the spring and then temporarily support a section of glazed earthenware drainpipes permanently cemented together in the form of an L (Fig. 1) so that the long arm of the L hangs down into the spring so that the water can flow up it. The short arm of the L is then cemented to the head of the tile drain and the temporary support gradually replaced by concrete which will form a permanent support. There may be some hours' delay in doing this owing to the need to wait for the area to dry up a little as the water flows away through the tile drain.

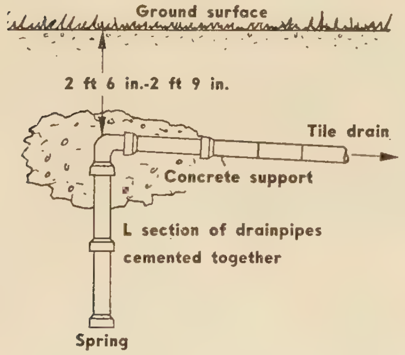


Fig. 1

Once the permanent support is completed the area can be covered over with soil, which can be sown to pasture when the whole area is sown down.

A modification of this method was carried out in the following manner by Mr J. A. Grant, a farmer of Winton, Southland. In his case the spring was coming through a fissure in limestone about 14 ft below the ground surface. Mr Grant enclosed sufficient pipes in a wooden box (Fig. 2) to reach from the tile drain to the limestone substrata. He then lowered this box into the spring hole until the box was resting on the limestone and centred it over the fissure through which the water was issuing. The box was then packed into position with rubble and soil and the tile drain joined to the pipes in the box. As soon as it was reasonable to cover it over with soil to a depth of 2 ft 6 in. this was done.

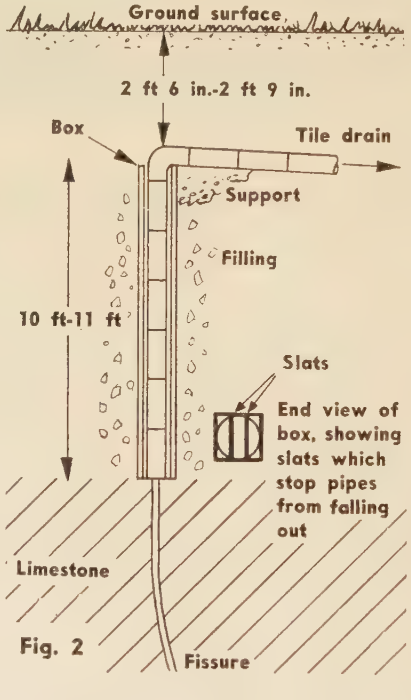


Fig. 2

Because the box will always be damp it should last a very long time. If the flow appeared only in winter and spring and dried up for some months of the year, the box would rot as the air penetrated the soil to it.

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Weed Control in Cereals

TOWARD the end of August the new season's crop of weeds will be appearing in autumn-sown cereal crops.

A harrowing at this time, with favourable weather, will achieve a fair degree of control of some of the annual weeds. As long as they are young when sprayed more effective control of weeds can be obtained with hormone weedkillers. These materials are generally effective against the annual weeds, which can substantially reduce crop yields, and against Californian thistle. Weeds such as wild turnip, tares, hedge mustard, fathen, and shepherd's purse are commonly troublesome unless sprayed.

Salts of MCPA or amines of 2,4-D, applied at 1 lb acid equivalent per acre, will give best results. Esters of 2,4-D, though effective against weeds, should not be used because of possible crop damage. Crops which have been undersown with clovers and need spraying should be treated with 2,4-DB at 1 lb acid equivalent per acre after the clover has formed its true leaves.

The correct time to spray is just after crop plants have completed tillering and are 6 to 8 in. high. Spraying earlier than this is liable to affect tillering and subsequent crop yields. Spraying too late reduces germination of malting barley and any other crops which may be kept for seed. Crops should be sprayed soon after feeding off so that weeds are not unduly sheltered from treatment.

—A. J. EBERT,
Fields Instructor,
Department of Agriculture,
Christchurch

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Accountants' Seminar of Interest to Farmers

AN accountants' seminar to be held at Victoria University of Wellington, from Thursday 27 August to Saturday 29 August should be of interest to farmers, students of farming, and those in any way associated with the farming business. The theme of the seminar is "Accounting for Greater Production", and a considerable part of it will be devoted to farm accounting and its problems.

Visits have been arranged to some business firms and the Soil Bureau at Taita on Thursday 27 August. Members should indicate if they wish to make these visits.

The seminar fee is 30s., with a half-price concession for students and members of Young Farmers' Clubs. Those who wish to attend should enrol as soon as possible with: The Accounting Seminar Secretary, Mr W. Summers, Victoria University, P.O. Box 196, Wellington.

◆

Farm Dairy Instruction Service

By M. J. McFETRIDGE,
Supervisor of Farm Dairy Instruction,
Department of Agriculture,
Hamilton

THE farm dairy instruction service of the Department of Agriculture has now been established 21 years. Fundamentally the aim of the service is to assist dairy farmers, through advice and guidance, in the production of the highest-quality milk and cream. Instruction and advice are given on correct methods of cleaning milking machines and dairy equipment and on the siting and layout of new dairy premises.

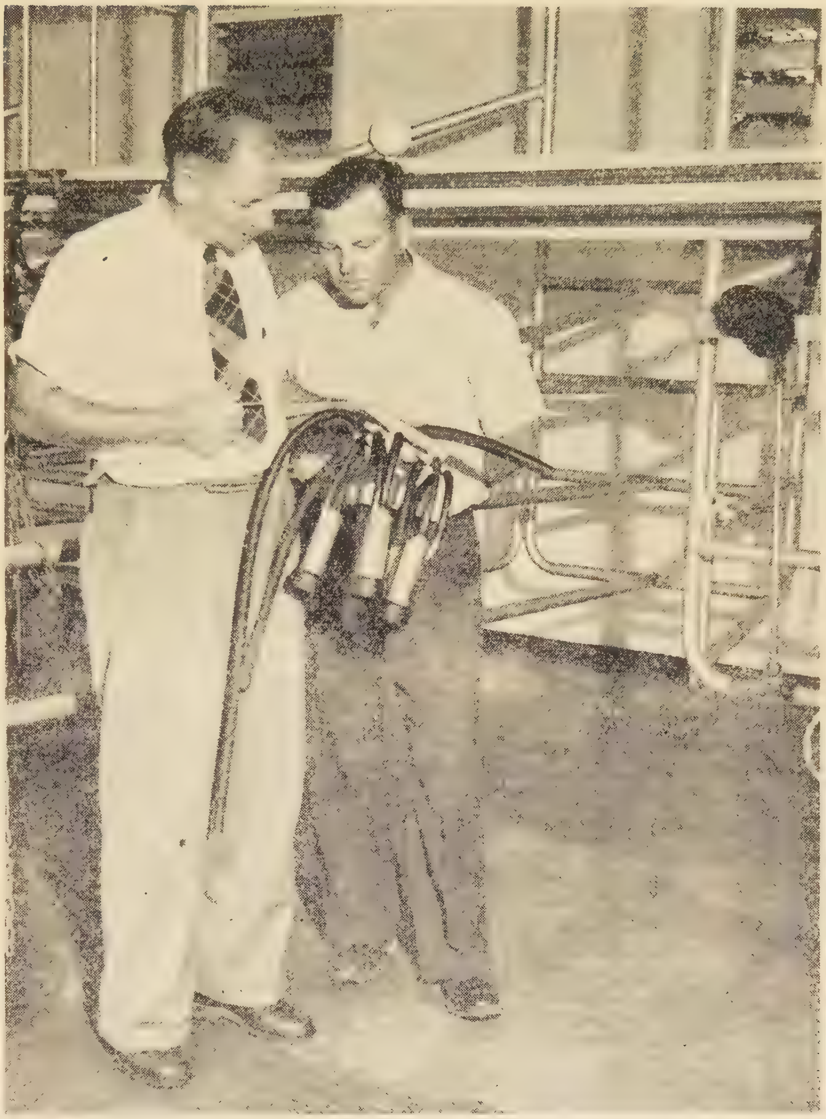
IN the early days of the industry dairy instructors were employed by the Department of Agriculture primarily to instruct at manufacturing dairies. With the growth of the industry, however, these officers were unable to meet the increasing demand for their services, and dairy companies appointed their own instructors to provide a service for their suppliers. Small companies formed groups with an instructor to a group. These officers combined the duties of instruction and herd testing.

Voluntary System

In 1918 a voluntary system was introduced involving agreement between the dairy companies and the Department of Agriculture that officers would be appointed by the Department and have the powers of inspectors under the Dairy Industry Act. By their resourcefulness and tact the officers appointed under this scheme laid the foundations for the present service.

The system did not supply a Dominion coverage of instruction, but applied only to those dairy companies which because of their size and location could give an economical service to their suppliers.

Though limited, the service provided was found to be essential in improving the quality of the raw material and industry leaders considered that for the overall benefit of the industry it should be broadened to include the whole of the Dominion.



Close cooperation between the farmer and the Farm Dairy Instructor is effecting improvement in quality of dairy produce through attention to hygiene in the shed.

Service Reorganised

In 1938 the scheme on this basis became operative under the jurisdiction of the Department of Agriculture. The new personnel were all men with long experience in dairy factories and many of them had also had practical experience on dairy farms.

The Second World War years thoroughly tested the reorganised service at its inception. The difficulties were many but the service gave valuable assistance.

With the emphasis on increased production for Great Britain and the Forces the instructors were fully occupied.

Farm Dairy Instructors at this time proved particularly helpful on many new dairy units established by inexperienced farmers. After the war, with labour and materials in short supply, instructors continued to give valuable assistance. Their sustained effort throughout this period was a big factor in maintaining both the quality and quantity of dairy produce.

Emphasis on Quality

In the past few years emphasis on overseas markets has been on quality and with the industry facing competition in the sale of its products it is essential that farmers should realise fully the part that quality in the raw material plays in the finished product, whether it is butter, cheese, or milk powder.

Dairy instructors are fully informed on the latest research findings, on industry matters generally, and, as in the early days, a premium is placed on practical experience in their selection for the work.

Their services are available to farmers on request and any problem associated with quality, equipment, buildings, etc., should be discussed with them.

The advice of Farm Dairy Instructors is invaluable on such matters as sanitation, water heating appliances, and cooling equipment.

Sanitation

Water heating appliances are probably the most important equipment at the dairy for the maintenance of sanitation and therefore quality. With their specialised knowledge the officers are able to locate causes of quality faults and make recommendations which, if carried out by farmers, will ensure that the trouble will not recur.

The local Farm Dairy Instructor has a close association with many milking sheds in his area which provides him with an excellent local knowledge, and his advice on the erection of new premises or the renovation of existing dairies can obviate faults in construction and layout which may later be found to be both costly and unsatisfactory to remedy.

Today the great majority of farmers give recommendations of instructors prompt attention and value the service offered. However, a minority fail to appreciate that quality depends primarily on sanitation at the dairy and are critical when they are requested to make improvements.

Inferior produce from these dairies can have a serious effect on the produce of the conscientious dairyman and therefore Farm Dairy Instructors use their powers as Inspectors under the Dairy Industry Act to bring standards up to those required or in bad cases to forbid the removal of dairy produce from a dairy until the premises are cleaned up satisfactorily.

The quantity of finest-quality milk and cream produced in the Dominion is the best indicator to the success of the service, which depends basically on the cooperation of the farmer and Farm Dairy Instructor.

Meteorological Records for June

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	51.2	— 0.9	66.3	30.9	9.52	15	+ 2.44	1.77	25	105
Auckland	160	51.2	— 1.8	64.0	36.9	2.32	14	— 3.07	0.60	30	128
Tauranga	12	48.2	— 1.7	63.0	28.8	1.05	7	— 4.50	0.36	22	137
Ruakura	131	45.9	— 1.6	61.3	22.2	2.34	15	— 2.44	0.62	13	100
Whakarewarewa ..	1,006	44.2	— 1.1	60.0	24.4	1.78	10	— 3.75	0.80	14	113
Gisborne	14	47.8	— 1.0	64.2	26.0	1.01	11	— 3.20	0.22	11	152
New Plymouth ..	160	49.4	— 0.7	60.6	33.7	2.45	12	— 3.73	0.89	10	130
Karioi	2,125	41.2	— 0.3	54.2	24.5	2.33	11	— 2.77	0.68	22	
Napier	5	48.2	— 0.5	67.5	31.0	0.72	6	— 2.34	0.26	14	162
Wanganui	72	47.9	— 0.9	62.1	30.2	0.77	5	— 2.62	0.36	21	140
Palmerston North ..	110	46.5	— 0.5	61.0	27.5	1.43	11	— 2.92	0.52	22	103
Waingawa	340	44.4	— 1.0	62.2	28.3	1.89	12	— 2.20	0.41	22	148
Wellington	415	47.7	+ 0.0	58.0	34.9	1.70	9	— 2.95	0.74	10	149
Nelson airfield ..	5	42.5	— 1.6	60.9	23.0	0.66	6	— 2.63	0.23	14	192
Blenheim	12	44.8	— 0.1	62.0	24.9	0.53	6	— 1.95	0.22	10	205
Hokitika	15	44.0	— 0.3	56.1	27.9	5.54	14	— 3.29	1.35	21	124
Hanmer	1,270	39.2	— 0.5	60.4	17.0	1.24	6	— 2.25	0.69	13	130
Christchurch ..	22	41.8	— 1.4	65.0	22.3	0.15	2	— 2.44	0.12	21	160
Ashburton	323	42.6	+ 0.8	65.4	20.6	0.66	3	— 1.94	0.45	21	168
Timaru	56	42.2	— 0.2	66.3	25.1	0.69	3	— 1.18	0.45	21	165
Alexandra	520	38.9	+ 1.2	64.0	19.0	0.42	7	— 0.37	0.11	12, 13	128
Taieri	80	42.9	+ 1.1	66.0	22.2	0.37	8	— 1.95	0.13	21	123
Invercargill airfield ..	0	42.6	+ 1.0	66.0	25.6	2.12	14	— 1.53	0.39	14	88
Chatham Islands ..	150	46.4	— 0.1	56.0	32.6	2.33	17	— 1.57	0.64	11	

Use of Elevated Equipment Near Power Lines

A NEW regulation has been gazetted which should reduce the number of accidents occurring through cranes and other elevated equipment touching electric power lines.

THE requirements are simple. No part of a crane or any other similar equipment may approach closer than 12 ft in any direction to any power line unless special precautions are observed.

The new regulation applies to all cranes and elevated devices whether mobile or stationary. It includes cranes, hoists, booms, derricks, masts, shovels, excavators, scoops, stackers, loaders, conveyor belts, earth-boring equipment, drilling rigs, pile drivers, ditch diggers, and drag lines.

The licensee (usually the local electrical supply authority) or owner of the power line is to specify what precautions shall be observed. The authority may provide or approve of a physical barrier between the machine and the line; it may disconnect the power in the line; or it may appoint or approve of a person to supervise and direct the operator of the machine.

Owners and operators of cranes and other elevated equipment should communicate with the appropriate supply authority if such equipment is likely to approach closer than 12 ft to any power line.

Traffic Regulations

The Traffic Regulations 1956, which place general restrictions on the loading and dimensions of motor vehicles and trailers, still apply to a crane or similar machine travelling along a street. The regulations state that no person shall operate any motor vehicle or trailer if the vehicle or its load or both is so high as to be liable to damage any construction or wires lawfully over the roadway used by the vehicle; in any case if the vehicle or its load exceeds a height of 14 ft from the ground it must not be operated without a permit.

Another new regulation is gazetted requiring mechanically operated hedge-cutters of the revolving flail type to be fitted with an effective guard when used under or near an aerial electric line. The guard is to prevent hedge clippings and other material being thrown into the line.

Much damage, interruptions to power supply, and danger to life have been caused by clippings and lengths of wire being thrown into power lines.

Ruakura Farmers' Conference Told

How to Rear Calves on Milk Substitutes

MILK by-products offer the best hope for very early replacement of whole milk in calf rearing. Buttermilk powder, which has an appreciable amount of fat and is usually cheaper than skim milk powder, is being increasingly used by farmers. The importance of fitting changes of diet to the calf's stage of development was stressed by Professor I. L. Campbell, Head of the Dairy Husbandry Department, Massey Agricultural College, in a paper to the Ruakura Farmers' Conference in June, in which he discussed trials with the feeding of buttermilk powders to calves. An adaptation of his address follows.

IN some respects feeding dairy cows is simpler than feeding animals of many other species. With the help of micro-organisms in its rumen, the cow manufactures some of the vitamins it needs, notably B complex vitamins like B_1, B_2, and B_{12}. The cow is able to utilise cellulose quite well, a thing we humans and the pig cannot do at all well. It can convert some simple nitrogen compounds to useful protein—something we humans cannot do either—and it can utilise a wide variety of carbohydrates such as the various sugars and starches that are found in plant material.

The newly born calf can do none of these things. Its rumen is not developed to handle bulky fibrous feeds. It lacks the teeming population of micro-organisms which attack cellulose, convert non-protein nitrogen to useful protein, and produce vitamins. It has not yet developed the capacity to produce all the enzymes necessary to break down the wide variety of carbohydrates found in the feed of more mature animals.

The answer to the newly born calf's problem is milk, a food which is almost completely digestible, contains proteins of high biological value, and is normally adequate in vitamins and minerals for the first few weeks of the calf's life. It provides as a source of energy a carbohydrate, lactose, which the calf is already equipped to utilise.

Calf's Rapid Early Development

The calf's development proceeds rapidly over the first few weeks of its life. From its surroundings—pasture, soil, hay, bedding—it picks up bacteria and other micro-organisms which establish themselves in the rumen. During its first or second week it samples grass, and perhaps hay, and by the third week it is grazing appreciably.

The rumen expands and the micro-organisms flourish. The calf develops the capacity to digest carbohydrates other than lactose, in particular starch, moderately well by about one month of age. This development is hastened by the early introduction of non-milk feeds. For example, the rumen at birth weighs only about a third of the total weight of the four stomachs. At the end of the second month, in calves given access to pasture, it has increased to half the total weight of the stomachs. Its absorbing surfaces are developed by the presence of the products of the fermentation of fibrous foodstuffs.

However, we must not rush this process of food substitution. If we try to introduce too much of these new foods too early, too much undigested material may pass to the small and large intestines where undesirable fermentation by bacteria causes upsets, scouring, and ill-thrift or worse. This is what almost invariably happens if we try to replace milk by a starchy meal too early and too quickly, say at two to three weeks. When this happens the only thing to do is to start from the beginning again. Stop feeding for 24 hours, but give warm water or lime water; give a laxative to help move out the offending material, and some appropriate anti-biotic or sulpha drug to restrict the bacterial activity in the gut. Then start feeding diluted whole milk, working back to normal strength and quantities over a few days.

If, then, we wish to reduce the quantity of whole milk used in calf rearing, we must use replacement foods which are appropriate to the stage of development of the calf at the time of substitution.

Use of Pasture

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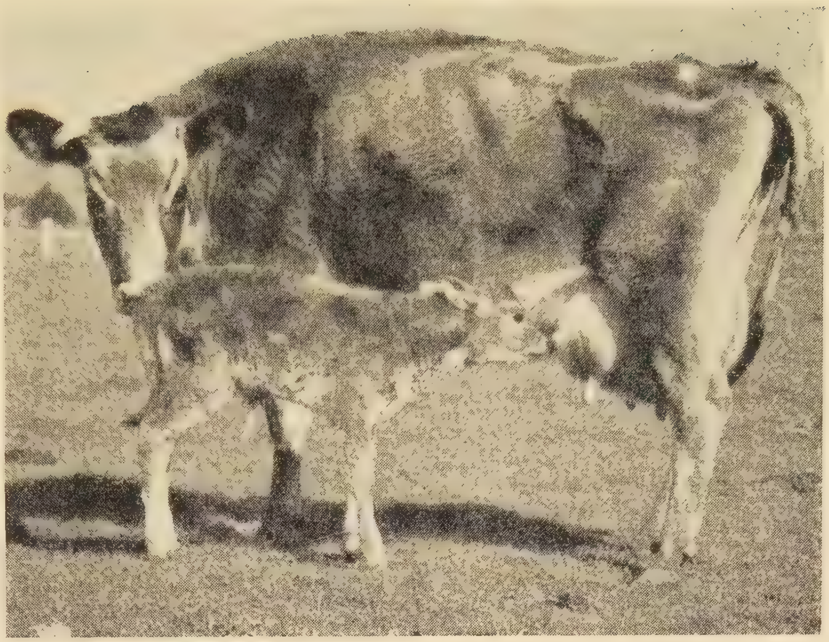

A newly born calf's rumen is not developed to handle bulky fibrous feeds. The answer is milk, providing lactose, which the calf is already equipped to use.

perhaps to a greater extent than farmers of any other dairying country. Under our conditions pasture can be entirely substituted for milk for well grown calves between six and 10 weeks of age. By this time the calf's intake from grazing is adequate and it is digesting the pasture as well as a mature animal, provided the pasture is leafy and clean. Rotational grazing seems the best means of ensuring this. Incidentally, new devices which have come on the market in the last year or so which provide a means by which calves can suck their milk from a large can have been found by some farmers to facilitate the adoption of rotational grazing at an early stage.

If we try to substitute an all-pasture diet for milk too early, say at two, three, or four weeks of age, we get an ill-thrifty, pot-bellied calf, if it lives at all. The digestive system has been stretched to accommodate the bulky feed, but not enough of it can be digested and utilised to provide the nutrients necessary for good growth.

Starchy Grains and Meals

From birth some time elapses before a calf can make good use of starchy foodstuffs. But by about the third or fourth week this capacity is developed in most calves sufficiently to make it worth while adding this type of foodstuff to the ration as a milk replacer should nothing better be available. Meals made up largely of cereal grains and their by-products, with oil seed residues such as linseed cake and small quantities of meat or fish meals, have been widely used with good hay in many countries to save milk in calf feeding. The inclusion of an appreciable amount of dried milk solids improves mixtures of this type.

The system usually advocated is to introduce the calf to very small amounts of these feeds in the third or fourth week and gradually to substitute them for whole milk, but to feed some whole milk for eight to 10 weeks.

Such a system can work quite well under good management. Growth rates are often rather slow. Care has to be taken not to rush the substitution and cut off the milk too soon or results can be disastrous. Calves vary from one individual to another in the speed with which they take to new feeds and in development of the ability to digest and utilise them. So it is particularly necessary in this type of feeding to be prepared to treat calves as individuals and to keep some on more whole milk for longer if they are not thriving.

The Use of Milk By-products

The butterfat in milk supplies energy to the calf and also acts as a carrier of the fat-soluble vitamins A and D. Apart from this a small amount of fat seems to be necessary in the diet of a very young calf for reasons not well understood yet. However, as the calf ages the need for butterfat declines; and as most butter factory suppliers on home separation know very well good healthy calves can be reared on skim milk plus good pasture after adequate whole milk feeding for three to four weeks and some whole milk to five to six weeks of age.

Under this system of feeding the calf normally receives adequate vitamin A as carotene from pasture. Being out in the sunlight, the calves do not need extra vitamin D in the feed.

If we try to substitute separated milk for whole milk too early in the life of the calf, for instance, in the first week, trouble occurs. The calf suffers from the lack of a small amount of fat, may run short of vitamin A, and the food may be too dilute for the very young calf to get its nutrients within the limits of its appetite for the bulky feed.

As a by-product from buttermaking we are now producing in New Zealand quite large quantities of buttermilk powder. A typical sample of this product gave the following analysis:

	Per cent
Moisture	4
Fat	10
Protein	35
Lactose	42
Ash	8

Essentially, the composition is similar to that of skim milk powder, except that the buttermilk powder has an appreciable amount of fat, an amount which may vary from sample to sample. The buttermilk powder can normally be bought more cheaply than skim milk powder.

Buttermilk powder has been shown to be a very useful milk replacer for calf feeding, and an increasing number of farmers are finding a place for it. While the feeding value varies a little with the fat content, useful approximations are:

1 lb of buttermilk powder provides the same available energy as 1 gallon of skim milk.

2 lb of buttermilk powder provides the same available energy as 1 gallon of whole milk.

Thus if 1 lb of buttermilk powder is mixed with 1 gallon of warm water the product can be used in the same way as liquid skim milk. This suggests the following feeding procedure which has proved reliable:

Weeks	Foodstuffs	
0-3/4	Whole milk	Pasture
3/4-5/6	Whole milk, buttermilk-powder-water mix	Pasture
5/6-8/10	Buttermilk powder	Pasture
8/10 on		Pasture

Within limits of convenience, the dilution is not important, provided we can think in terms of using 1 lb of the buttermilk powder where we might have used 1 gallon of skim milk. Under good management and where ample supplies of pasture are available, once a day feeding from one month onward seems to give satisfac-

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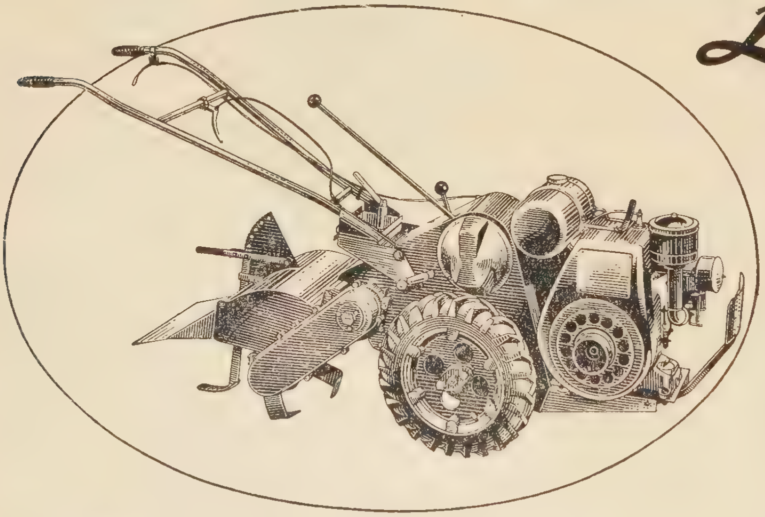

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THERE'S AN AGENT IN YOUR AREA FOR SALES AND SERVICE

In New Zealand the use of pasture as a milk substitute has been exploited more than in perhaps any other dairying country. Pasture can be substituted entirely for milk for well grown calves between eight and ten weeks of age.

tory results. At Massey Agricultural College last spring satisfactory growth rates were obtained with the use of this feeding schedule, but feeding once a day from three days of age onward. While this was successful in this trial it is probably a more hazardous procedure. Delaying once-a-day feeding to one month would be safer.

Early Replacement of Milk

How far can we go in replacing whole milk with substitutes? The more we cut the whole milk the greater the nutritional hazard will be; the better adapted the milk replacer must be to the requirements of the pre-ruminant calf; the better the rest of the management must be to give the calf the best chance of taking any nutritional hurdles.

Points such as providing shelter, reducing the danger of infection, making sure each calf gets its rightful share of the food, and watching for the onset of scours and applying early remedial measures become even more than normally important. Experience at Massey College has shown that breed differences exist. It has been easier to cut the whole milk to a minimum with Friesians than with Jerseys.

Milk by-products offer the best hope for very early replacement of whole milk, and of these, buttermilk powder has been used with moderate success in trials over the last few years.

Friesian calves have been successfully reared when changed to buttermilk powder after colostrum. It is essential to feed the colostrum because of the protection it gives a calf against infection. As the milk from newly calved cows should not be sold for four days post calving, all milk of this type should be used for calf feeding anyway. Newly born calves need it. For older calves it can replace normal whole milk quite safely. It should be used diluted with 50 per cent of its volume of water, 1 gallon of the mixture replacing 1 gallon of normal milk.

After colostrum feeding for four days, the calves may be changed from whole milk to a buttermilk powder mixture of 2 lb of buttermilk powder per gallon of warm water. (This gives a liquid which has approximately the same energy value as whole milk.)

The change-over is better made over several days. In the second week the calf can be entirely on buttermilk powder plus pasture, the mixture of buttermilk powder and water being fed in the same quantities as you would use with whole milk, except that with buttermilk powder it is more important not to overfeed.

If good pasture can be made available, the calf can be weaned early when it reaches the appropriate size (for example, girth 33½ in. for Jerseys), or the buttermilk powder feeding can be carried on for an extended period at reduced quantities after the eight to 10 weeks stage.

In our experience Friesians can be successfully reared on this system with milk reduced to something like 12 gallons, including the colostrum. In trials at the Dairy Research Institute Jersey calves were reared by changing to buttermilk powder straight after the colostrum feeding in the first week. At eight weeks the calves were healthy, but their growth rate had been slower than normal, especially over the first three weeks. It would seem safer with Jerseys, when endeavouring to reduce calf milk to a minimum by using buttermilk powder not to change over completely to powder until after the second week.

There was a suggestion in some of the work at Massey College and the Dairy Research Institute that calves changed to buttermilk powder entirely during their first week might be vitamin A deficient. The calves would be eating very little pasture at this stage. Until this point is cleared up by further work, it would seem good insurance to add a vitamin A concentrate to the diet in such cases for the first month.

I would like to emphasise again that the earlier whole milk is replaced by buttermilk powder the greater the hazard. Normally it is quite safe at five to six weeks. How much earlier to make the change is a decision which depends mainly on:

1. The value of the whole milk replaced.

2. The value of the calves.

3. The skill of the feeder and the time and care that can be given to calf rearing.

4. The suitability of the conditions for calf rearing.

One final point on the use of buttermilk powder: We have found it a very valuable food to give to calves which have had any very bad check, say through disease or nutrition, fed either as a gruel or as a dry feed mixed with a small amount of bran or crushed grain to help palatability.

FARMERS!

COPPER deficiency in beef animals has been evident in some areas in New Zealand in greying of the coats of Aberdeen Angus cattle, and unthriftiness. The condition can be prevented by increasing copper supplies to the animals, and effective and cheap control of the disease has been achieved by a method of subcutaneous injection of copper compounds arising from research into the disease by the Wallaceville Animal Research Station. Copper cerates for treating animals can now be bought and farmers can get advice on their use from veterinarians or Livestock Instructors.

These forms of Copper Injection are as prepared at the request of the Department of Agriculture Animal Research Station, Wallaceville.

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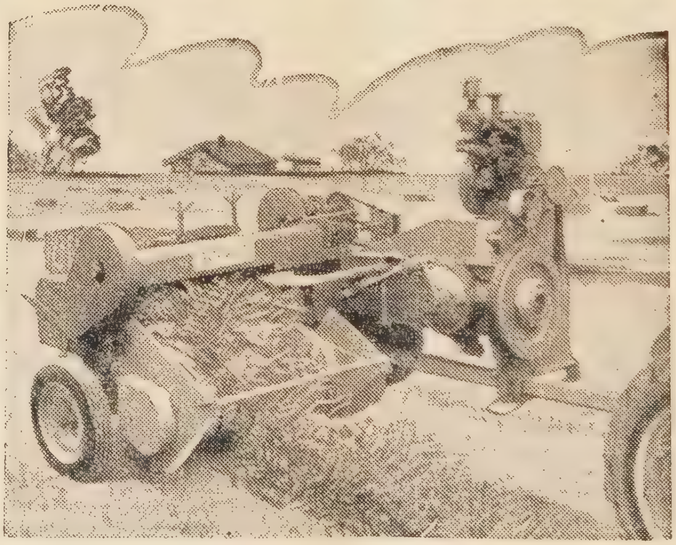

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Crop Production

BLUE LUPINS

By C. P. WHATMAN,
Instructor in Agriculture,
Department of Agriculture,
Ashburton

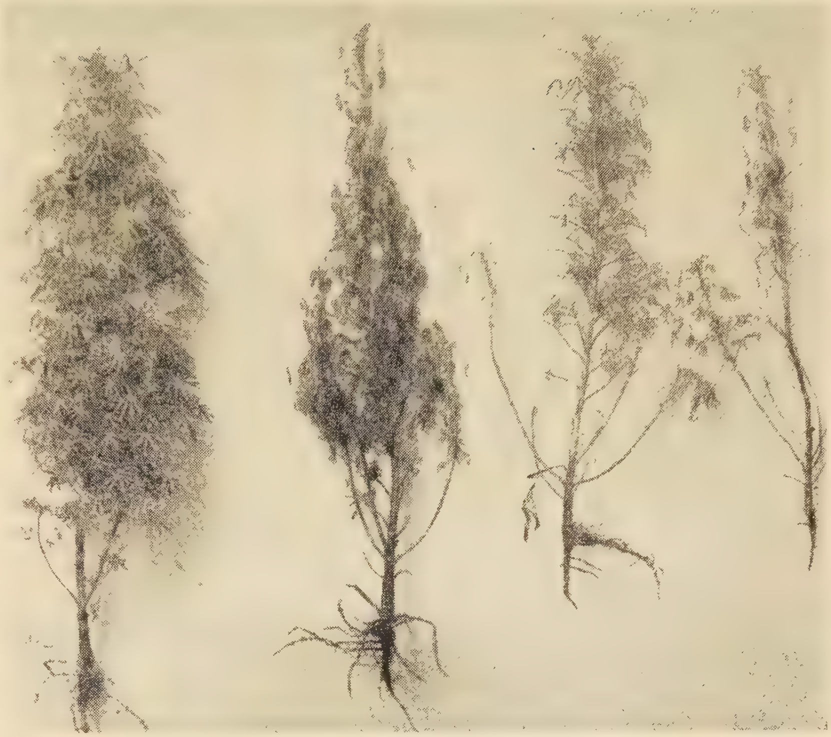
BLUE lupins are grown principally on the medium to light soils of Canterbury, particularly in those districts of less than average rainfall, either as a replacement for the turnip crop or to supplement turnips or other winter feed crops. Their high nutritive quality, their relative freedom from disease, and their immunity from the pests that attack turnips have made them an important pioneer crop on much of this land. Over the last 10 or 12 years the improved fertility of the light lands, the increase in the lucerne area and in hay feeding, and the greater use of other green-feed crops such as Italian ryegrass and saved pasture have meant less dependence on the lupin crop. The area has decreased very greatly. It is doubtful if it will regain the place it had 10 or 15 years ago, though more cereal cropping on the light and medium land is likely to cause a small increase.

IN the Ashburton County, and particularly between the Rakaia and Ashburton Rivers, blue lupins have been of the greatest importance. Grown both for feed and for seed they have played a part in the soil improvement that has taken place in that area. They do not demand high fertility, they tolerate acid soils providing they are well drained, and they have a low phosphate requirement. The symbiotic bacteria in their root nodules are able to fix atmospheric nitrogen which is then available for succeeding crops.

Varieties

Several varieties of blue lupin (*Lupinus angustifolius*) and one variety of yellow lupin (*L. luteus*) have been tried from time to time. The common or bitter blue lupin suffers from the disadvantage that it contains an alkaloid giving an extremely bitter taste to the plant. Research has shown that this substance increases from 0.25 per cent to 0.4 per cent during flowering and then falls to about 0.2 per cent as the seed ripens. This alkaloid, beside being unpalatable to sheep which are unaccustomed to it, can cause "staggers" or occasionally death. It makes the plant unsatisfactory as a fattening feed for lambs and various attempts have been made to select lupins with a lower percentage of alkaloid.

"Sweet" varieties of both blue and yellow lupins, of very low alkaloid content, were available a few years ago, but the less robust nature of these varieties prevented their becoming popular. They were also poorer seed producers than the bitter blue variety.



"Sore shin", caused by the pea mosaic virus, is the most serious disease of lupins. A healthy plant is at left and the others show infection at varying stages.

Blue Lupin Growing in New Zealand

Area Grown
Varying, at present about 5,000 acres

Main Growing District
Canterbury, chiefly Ashburton County

Most Suitable Soils
Light to medium well drained soils; not necessarily of high fertility or well limed

Varieties
Borre (sweet) lupin, particularly for lamb fattening.
Bitter blue lupin for winter feeding or green manuring

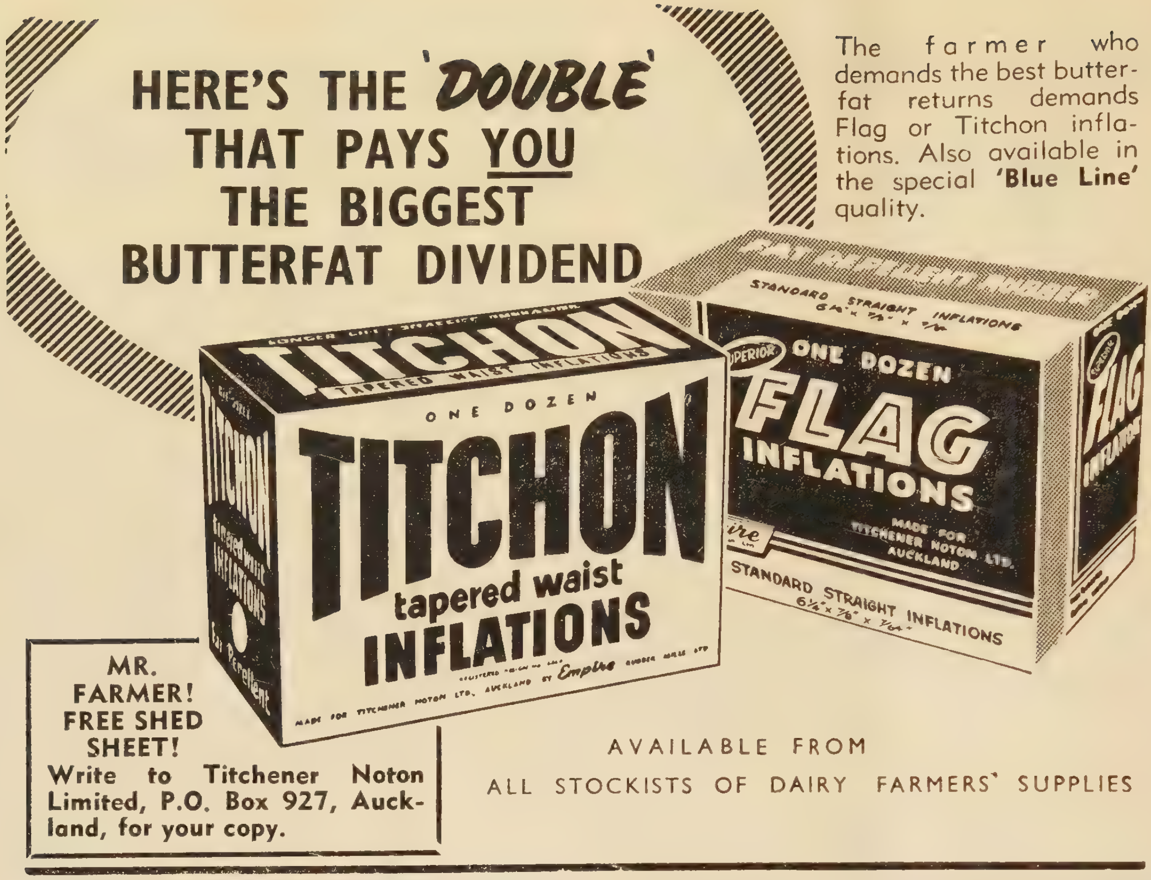
Fertiliser
Not usually applied except when sown with turnips, rape, or grass, when 1 cwt of superphosphate is applied

Normal Sowing Rates
Seed: $2\frac{1}{2}$ to 3 bushels alone
1 bushel with either:
$\frac{1}{2}$ to $\frac{3}{4}$ bushel of oats or Italian ryegrass or 1 to $1\frac{1}{2}$ lb of rape or 6 to 8 oz of turnips

Normal Sowing Period
February to April for successive winter and spring feeding
September to October for lamb fattening
March, September, or October for seed

Average Yield of Seed
30 bushels

Commercial Bushel Weight
60 lb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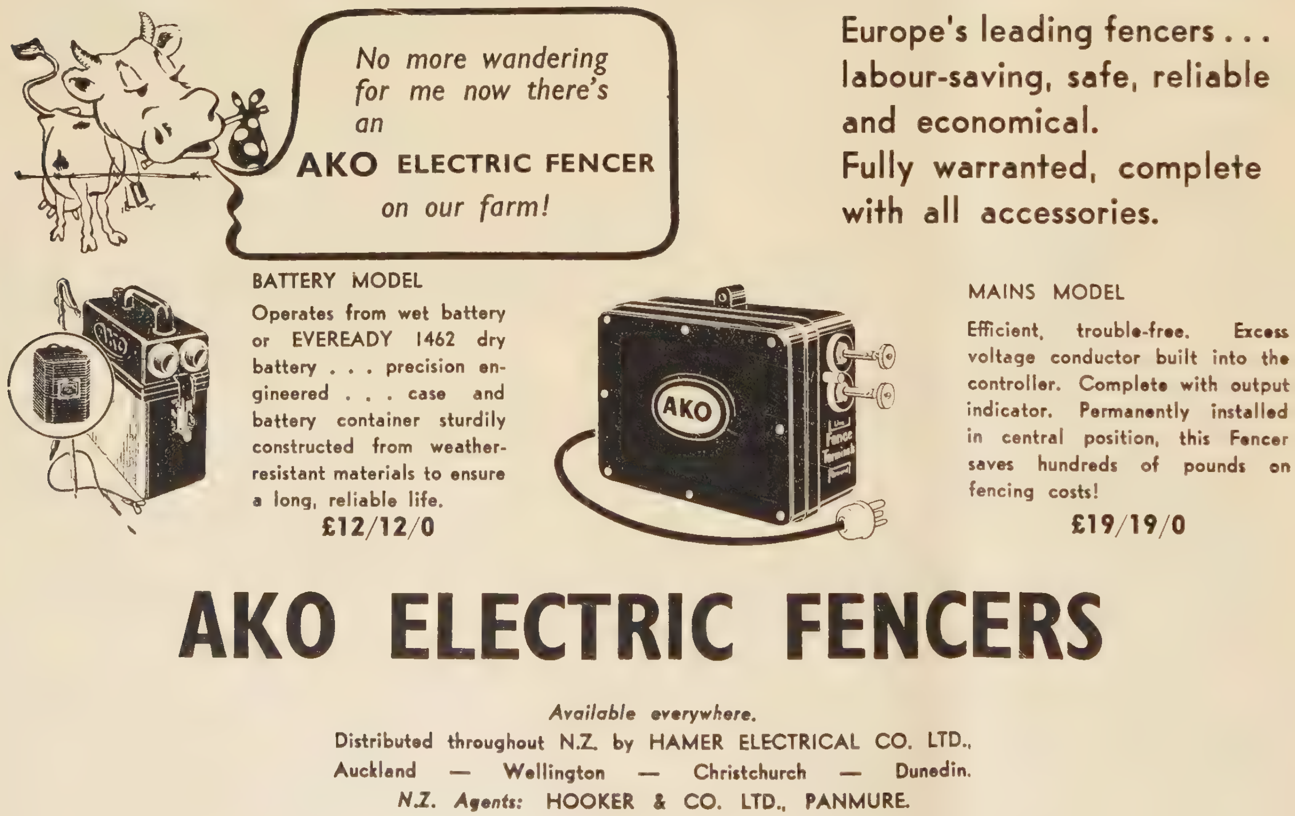
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Another sweet blue lupin variety of much greater vigour and better seed yield called Borre lupin has now been distributed as a lamb fattening lupin. So far it has not achieved a great deal of popularity, but it is too early yet to determine its place under New Zealand conditions.

The cost of seed places lupins at a grave disadvantage as compared with rape and it appears unlikely that they will prove more than a useful but minor supplement to normal fattening crops.

Sowing for Winter Feed

Blue lupins for winter feed are best sown on a well prepared seedbed, preferably after a fallow from grass. The soil should be firm and sufficiently moist to ensure germination and establishment.

The time of drilling should be adjusted to the period for which feed is required. Sowing in early February will give a maximum of winter feed. Sowing earlier than this will mean that the crop must be fed off during autumn, as it becomes susceptible to frost as it approaches the flowering stage.

Where blue lupins are required throughout winter, sowing in breaks at about fortnightly periods from early February until March is sound practice. Late March or April sowings will provide spring feed. These may be made after a cereal crop and a minimum amount of cultivation.

Though blue lupins have in the past very often been sown pure at 2½ to 3 bushels per acre, the usual practice now is to sow them at about 1 bushel per acre with other feed. This is usually turnips at 6 to 8 oz sown in mid February, but oats or Italian ryegrass at ½ to ¾ bushel may be used.

Sowing for Lamb Fattening

Owing to their relative unpalatability bitter blue lupins are rarely sown for lambs. Trials with Borre lupins show that they compare more than favourably with rape crops and that the production and fattening value of a Borre lupin/rape mixture are greater than those of pure rape or pure Borre lupin sowings.

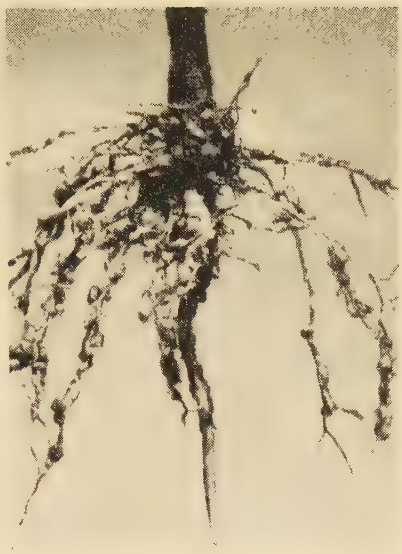
The recommended mixture is 1 bushel of lupins with 1 to 1½ lb of rape.

The normal time for sowing rape is satisfactory for the sowing of the mixture.

The limiting factor in the use of lupins in this way is the cost of the seed compared with the cost of a full sowing of rape.

Sowing for Seed Crops

Farmers who make a practice of sowing blue lupins usually harvest their own seed. The market for seed is erratic, depending on a demand which varies widely from year to year, but generally surplus seed can be disposed of at a price which gives a reasonable return. A few hundred tons are exported each year to Australia.



Nodules on the roots of blue lupins indicate the presence of beneficial nitrogen-fixing bacteria.

Seed crops may be sown either in autumn or spring. Autumn sowings are made in March at 2 to 3 bushels per acre, and the crop ripens in December or early January. Sowing in September or October gives a late and uneven ripening, making direct heading difficult, but owing to the cooler weather there is less loss from the shattering of the seed. Yields per acre are not heavy, 30 bushels being average.

Direct heading is the most satisfactory method of harvesting, but is possible only when crops are free from weeds and ripen evenly. Crops can be windrowed and threshed out of the swath by the header, but the loss of seed is usually greater than by direct heading. Losses can be reduced by avoiding threshing in the heat of the day when pods are most brittle.

If the seed is threshed out of condition, it should be put in partly filled sacks and hung on a fence until completely dry. If stored in bulk, it will lose its power of germination rapidly. For this reason the germinating capacity of a line of seed should be tested before sowing.

Feeding off

Though blue lupins can be fed at almost any stage of growth, the amount of feed is greatest just before flowering, and this is the stage at which one should aim to graze the crop. Sheep should be introduced to blue lupins gradually. When they become accustomed to the taste, even of the bitter variety, they will eat them without hesitation, often in preference to other feeds. Where they form part of the regular feeding programme little difficulty is experienced.

The usual practice is to break feed as with a crop of turnips. Less wastage of the crop occurs in this way. When sheep are first put on a break it is advisable to leave them for short periods only. As they become accustomed to the crop the grazing period can be gradually extended.

Other Uses of Blue Lupins

Apart from their value as sheep feed blue lupins are very useful for other purposes. The value of blue lupins in the home garden or orchard as a green manure crop is well known. Less well known but quite important is the suitability of blue lupins for quick establishment on sand drift country to assist in stabilisation. For this purpose their speedy germination, rapid growth under somewhat adverse conditions, the considerable bulk produced, and the fact that the plant reseeds itself readily are valuable characteristics.

Diseases of Lupins

The lupin crop is relatively free from disease. Where losses from disease are considerable there are usually environmental factors such as excessive rain, poor drainage, or moist, humid conditions which favour fungous diseases.

Virus Disease

Pea mosaic (*Pisum* virus 2) produces on lupins symptoms called "sore shin". The leaves curl at the growing point and appear greyish. The tips bend to one side and brownish blotches appear on the stem, usually down one side. This discolouration girdles the stem and, as death approaches, the foliage takes on a reddish bronzy hue.

The virus attacks red clover as well as peas and lupins and is spread by aphids. It is neither seed nor soil borne and is serious only when conditions are favourable for the multiplication of the aphid vector and where there are adjacent affected plants.

Plants infected before flowering usually die, but those infected later may survive, though they make no further growth and seldom set seed.

Fungous Diseases

Several fungous diseases can be prevalent under moist, warm conditions, though they rarely cause material reduction of the yield of feed or seed.

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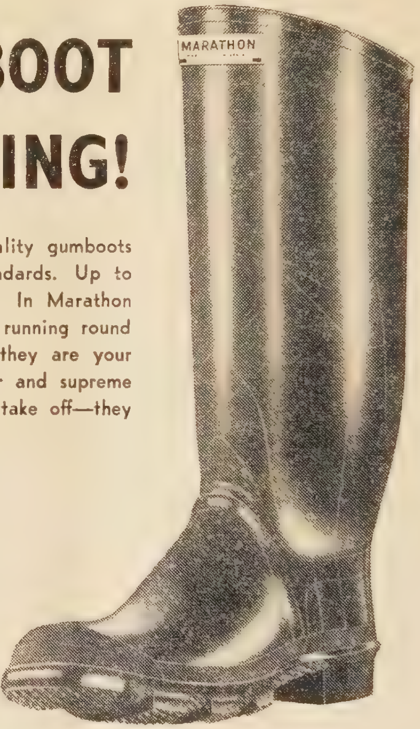

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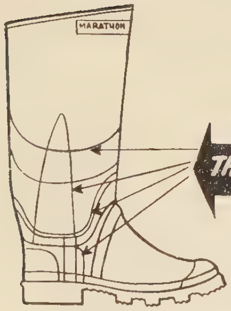

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Ascochyta **spp.**

Stem canker, caused by *Ascochyta* fungus, can be distinguished from "sore shin" by the presence in the brown stem lesions of dark spots, the fruiting bodies of the fungus, which exude a mass of pink spores in wet weather.

Spring-sown crops are rarely affected, but the disease can be particularly severe in autumn crops where wind or frost has caused damage. The disease is spread both by seed infection and by wind-blown spores from the residues of previous crops.

Botrytis cinerea

Botrytis cinerea is a fungus that attacks a large range of plants, usually ones which have been damaged in some way. On lupins it appears as a yellowish slimy ring just above ground level which later develops a grey feathery mould. The plants turn yellow and die. The disease is prevalent in plants which have passed through a hard winter.

Sclerotinia sclerotiorum **(Sclerotinia Disease)**

Sclerotinia sclerotiorum (sclerotinia disease), like the previous fungus, attacks a large range of plants. It attacks the plants at or above ground level, where a white weft is seen. Later the sclerotinia (black, horny bodies) develop and are attached loosely to the stem. The disease is soil borne and can cause the death of a considerable number of plants under conditions favourable to it.

Root Rot (*Phytophthora cinnamomi*)

Root rot (*Phytophthora cinnamomi*) fungi cause active rotting under very wet conditions and are also responsible for poor strike. Seed dusting with one of the mercury dusts will improve emergence under unfavourable soil conditions.

Lupins as a Crop

Though the importance of the lupin crop has decreased over recent years, it is still a valuable supplement to other winter feeds. It is of particular value as a plant which will assist the rapid improvement of light or run-out land. It can partially or wholly replace turnips where these have become unreliable.

The distribution of a productive sweet lupin, the Borre lupin, provides an additional lamb-fattening crop of potential importance in areas where rape is frequently attacked by aphids and other pests.

Blue lupins, bitter and sweet, can be sown alone or in mixtures with turnips, rape, oats, or any of the ryegrasses. By varying the time of sowing they can be made to produce a good quantity of nutritious feed at almost any period.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during September as follows:

1YA Auckland, 7.45 p.m.

3 September—"Springtails", by D. M. E. Merry and D. L. Janett, Instructors in Agriculture, Department of Agriculture, Pukekohe.

10 September—"Matters Topical to Poultry Farming", by S. G. Haddon, Poultry Instructor, Department of Agriculture, Auckland.

17 September—"Silage Harvesting Machinery", by J. L. Doutre, Machinery Instructor, Department of Agriculture, Auckland.

24 September—"Care of Young Calves", by G. Wallace, Veterinarian, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

14 September—"Rabbits and Opossums in New Zealand", by W. R. Tocker, Livestock Instructor, Department of Agriculture, Hamilton.

21 September—"Supplementary Crops", by J. D. Currie, Instructor in Agriculture, Department of Agriculture, Hastings.

28 September—"Mole Drainage", by D. F. Scott, Machinery Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7 p.m.

9 September—"Progress of Hydatid Eradication Schemes", by A. G. W. Stevens, Livestock Instructor, Department of Agriculture, Rotorua.

23 September—"For the Commercial Vegetable Grower", by B. M. Piper, Horticultural Instructor, Department of Agriculture, Tauranga.

2YZ Napier, 7.10 p.m.

1 September—"Preparation of Stock for Freezing Works", by F. D. Usher, Meat Inspector, Department of Agriculture, Hastings.

15 September—"Wheat Growing in Hawke's Bay", by A. J. Coughlan, Fields Instructor, Department of Agriculture, Hastings.

29 September—"Meat Inspection—Ancient and Modern", by Z. V. Warren, Meat Inspector, Department of Agriculture, Hastings.

2XA Wanganui, 8 p.m.

3 September—"For the Country Woman", by Mary MacDonald.

10 September—Farming News.

17 September—"Beware of Excessive Fibre Feeding to Pigs", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

24 September—"Apple Leaf Curling Midge", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

2ZA Palmerston North, 12.36 p.m.

14 September—"Use of Potash", by C. J. Christie, Instructor in Agriculture, Department of Agriculture, Palmerston North.

28 September—"Some Problems Presented by Mechanisation", by R. G. Burton, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

7 September—"Weed Control in Crops", by A. Ebert, Fields Instructor, Department of Agriculture, Christchurch.

21 September—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

2 September—"The Care of Pigs in Spring", by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

7 September—"Lucerne", R. H. Smith, Instructor in Agriculture, Department of Agriculture, Invercargill.

9 September—"Organic Matter and Soil Fertility", by R. H. Jackman, Scientific Officer, Department of Agriculture, Palmerston North.

14 September—"Pollination of Lucerne", by D. W. A. Seal, Apiary Instructor, Department of Agriculture, Invercargill.

16 September—"Artificial Nitrogen for Grass Seed Crops", by L. W. Gorman, Scientific Officer, Department of Scientific and Industrial Research, Palmerston North.

21 September—"Recent Trends in Orchard Spraying", by D. W. Wilson, Horticultural Instructor, Department of Agriculture, Roxburgh.

23 September—"The High Country—Development and Progress", by L. P. Chapman, Mt. Somers.

28 September—"Cropping for Winter Feed", by J. G. Richards, Instructor in Agriculture, Department of Agriculture, Oamaru.

30 September—"The High Country—the Future", by L. P. Chapman, Mt. Somers.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. ("Country Journal"). Thursdays at 12.33 p.m. ("News for the Farmer").

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report" followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays, 12.33 p.m. ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer") and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Fridays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XB Masterton, Fridays at 6.45 p.m. ("Farm Session").

2XN Nelson, Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest") and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer"), and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service") and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m., Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

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Feeding Concentrates to Milking Cows

By G. R. MOSS,
Instructor in Agriculture, Department of Agriculture, New Plymouth

CONSIDERABLE quantities of dairy concentrates are sold in New Zealand each year. Their place as a supplementary ration to pasture and crop is limited by their cost in relation to the returns obtained from the sale of milk and butterfat. This and such practical aspects as the type of concentrates to feed and how to buy them are discussed in this article.

THE term "concentrate" is used when referring to a foodstuff low in fibre but high in digestible nutrients. Most dairy concentrates are seeds or seed products such as bran and linseed meal. Other types of concentrates include molasses, buttermilk powder, and lucerne meal.

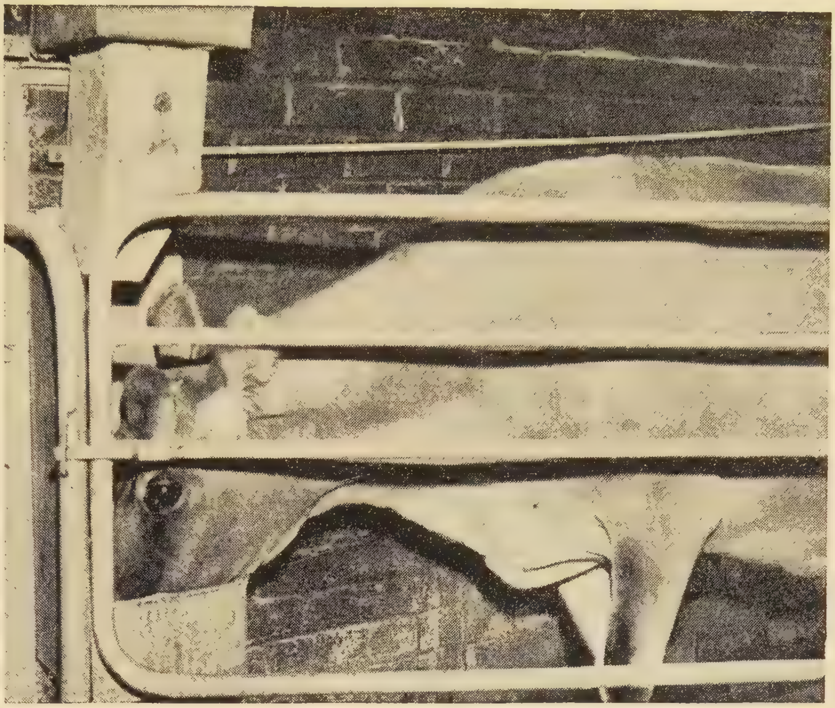
The feeding of concentrates can be economic only when they are cheaper than alternative foodstuffs, where there are not enough foodstuffs available to meet the requirements of the animal, or where the foodstuffs available are lacking in quality. With the dependence on pasture and crop in New Zealand and the seasonal type of farming so interlocked with pasture growth, there is often a time when a crop failure or an unpredicted crisis makes the feeding of a dairy concentrate a possible solution to a difficult situation.

When Concentrate Feeding May Pay

Concentrate feeding is most likely to pay when returns from the sale of milk are relatively high, as with town milk supply. Even for town milk, concentrate feeding should be used with discretion owing to the extra costs. Concentrates sell at between £20 and £40 a ton*, or even more for dehydrated lucerne meal and other high-protein rations. Because of these high costs it is essential to obtain the maximum returns possible if a profit is to be made.

Concentrate feeding is most likely to give the best return when:

- The level of feeding without the concentrate ration is low.
- The cows are still producing at a reasonably high level.
- The cows are potentially high producers.



There are two methods of feeding concentrates on New Zealand dairy farms. The more common method can be referred to as "crisis feeding", that is, feeding for a short period during a feed shortage. The second method is to feed concentrates continuously throughout the milking season.

Crisis Feeding

Feed crises are most likely to occur during the first few weeks after calving or during a dry summer or severe winter.

Previous training in meal feeding is helpful when a sudden switch to a concentrate is made during such a crisis. If cows have not been accustomed to this type of feeding and refuse the ration, a substantial drop in milk production will occur.

Calving normally takes place six to eight weeks before the spring flush of pasture growth. If the autumn is dry and unfavourable for growing autumn-saved pasture, it may be advisable to feed an alternative supplement until feed requirements can be met adequately from the pasture.

Work at the Department of Agriculture's Ruakura Animal Research Station with identical twins has shown that concentrates fed after calving when the cows were not able to get their full requirements from the pasture gave a payable return. Concentrates were fed for eight weeks after calving. During the period of feeding the increase in milk and butterfat did not pay for the concentrates fed, but when returns were calculated on the basis of increased production over the whole lactation there was a substantial profit under town milk and factory supply conditions.

These trials were repeated where ample feed was available from pasture after calving. Concentrates did not then give a payable return for butterfat production, but there was a small profit with town milk supply.

The results of these trials indicate a substantial carryover effect. Under conditions of feed shortage meal used early in lactation is more likely to give a greater return than when used later, not only because the response after good feeding will be obtained longer, but because the degree of response is likely to be greater.

Carryover Effect

The feeding of concentrates to only the higher producing cows in a herd

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* The grain and meal ton is the short ton of 2,000 lb, not 2,240 lb.

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is often recommended. This may be sound advice if the concentrates are being used in a liberally fed herd, but it must not be forgotten that the profits come from the carryover effects and that these arise not only from increased levels of production but from increased lengths of lactation. In the Ruakura trials some of the largest differences in production were obtained with low producing sets of twins simply because the meal-fed members continued to produce much longer than their unsupplemented mates.

An abnormally dry summer can cause a sudden decline in milk and the premature drying off of the herd. Precautions can be taken to avert such circumstances by the use of cropping or irrigation, but many dairy farmers are prepared to take the risk. When such conditions occur, the feeding of a concentrate ration should be considered, especially if other alternative feedstuffs such as silage and good hay are unavailable or insufficient to check declining production.

Many farmers make the mistake of feeding concentrates too late. If concentrates are to be used during a dry summer, they should be fed early before production drops. The dairy farmer must be prepared to feed heavily until pasture growth is adequate. Once concentrate feeding has begun it must be continued until requirements can be fully met from pasture; otherwise there will be a sudden decline in production.

Winter milk production is difficult. The basic ration for winter milk is pasture or conserved pasture. Techniques such as provision of autumn-saved pasture or special-purpose pastures in which species are included for their winter growing ability are available. Winter crops for milk production include chou moellier, swedes, and (more especially in the South Island) green cereals. Winter problems include pasture pugging and adverse conditions for feeding out supplements such as hay and silage. Concentrate feeding at this time of year can make farming easier by reducing the amount of feeding out required and can play a valuable role if a crop or pasture growth fails. In some districts where winters are severe special production allowances are paid for autumn and winter milk.

Under winter conditions or any conditions which reduce the level of feeding, the solids-not-fat (S.N.F.) content of the milk may be reduced. If the average S.N.F. percentage of a herd is already low, as it may be in some Friesian herds, a further drop may reduce the level below the legal figure of 8.5 per cent for town milk. Additional feed in the form of a suitable concentrate may help to avoid such a drop and the subsequent penalty.

Concentrate feeding may be fully justified on a town milk farm if it can be used to increase production during the quota-determining period. During this period an extra gallon of milk may mean that for each day during the following season more milk can be sold at the premium town milk price. Provided the farmer is confident of meeting the following season's commitments, concentrates fed at this time can increase returns above the immediate benefit from the extra milk produced.

When our pasture management techniques become more efficient and field practices such as drainage and irrigation are used more widely the need for concentrate feeding to meet feed crises will be less.

Continuous Feeding

Continuous concentrate feeding is expensive, but has the advantage that it facilitates feeding out and assists yarding and bailing of the cows. This method has the greatest appeal on farms where test bucket figures are important in the sale of stock, as with pedigree herds. The method normally used is to ration the cows individually, giving the biggest rations to the highest producers. It is common during cold, wet spells to increase the rations in an endeavour to compensate for loss of grazing time and consequent loss of production. The biggest disadvantage of continuous bail feeding is that it increases the risk of spreading disease among stock. Tuberculosis especially can be passed through a herd using common feed troughs.

The feeding of concentrates for milk production is not simply a matter of feeding a cow a definite amount of a ration to obtain an extra gallon of milk. Only a certain percentage of any concentrate feed will be digested and enter the bloodstream. Once in the bloodstream the nutrients can be drawn on for numerous purposes apart from milk production.

No amount of extra feeding can increase production past a certain point. The law of diminishing returns applies to the feeding of animals as it does to the application of a fertiliser.

The economics of continuous feeding of concentrates is difficult to work out in actual pounds, shillings, and pence. Under normal New Zealand conditions the method is too expensive and is not to be recommended. It is sometimes maintained that the feeding of concentrates over a season has increased production by a payable percentage over a previous season. This may be so, but all factors must be taken into consideration including climatic conditions and changes in management policies.

Recent experimental work at the Rowett Research Institute, Aberdeen, failed to show any economic advantages from feeding a concentrate ration to cows well fed on intensively managed pastures. The concentrate fed during the Aberdeen trials was a dried molasses-treated sugar beet pulp.

What to Feed

Under New Zealand conditions a balanced concentrate ration is not required. What is required is a supplementary ration to make up crop and pasture deficiencies. Because of this a simple concentrate ration may be suitable.

Before deciding what concentrate to feed, deficiencies should be fully considered and the type of concentrate most likely to make up a balanced ration should be bought. In a dry summer, for example, if feed available on a farm is reduced to a minimum of pasture and overmature silage and hay, the feeding of a concentrate containing a medium level of protein will give best results. On the other hand if there is a supply of irrigated pasture, lucerne, red clover, or high-quality hay or silage, the supplementary concentrates need not be high in protein and a crushed grain or grain by-product would be satisfactory. In winter good autumn-saved pasture may supply all the protein requirements, and a ration at this time needs to be high in energy only.

In general, the main requirement in any dairy ration is energy; protein requirements are of secondary importance.

Once the deficiencies have been determined a suitably priced ration with a known feed value should be selected. Care should be taken to buy a palatable concentrate with good keeping qualities. Often concentrates refused can be made palatable to stock by the addition of molasses.

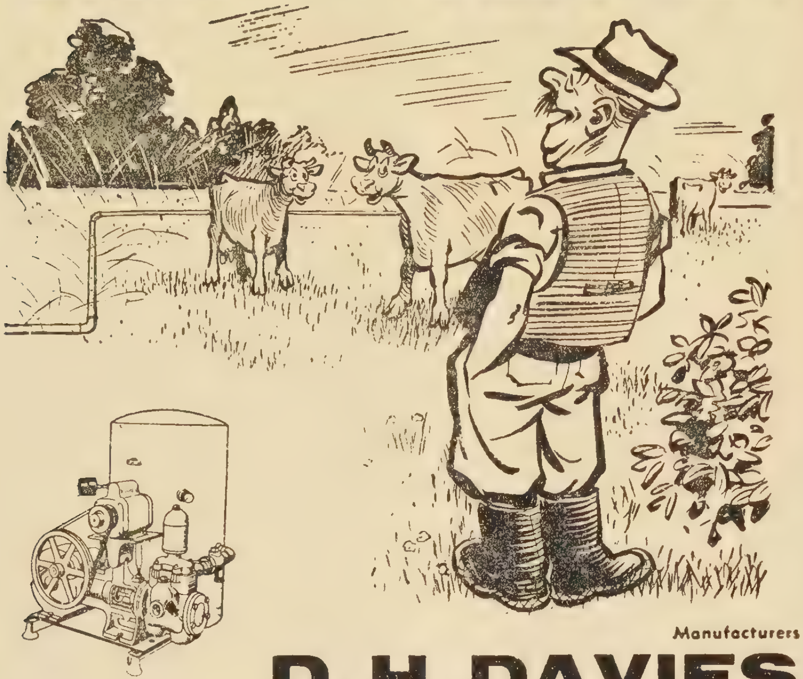
Are Additional Minerals Necessary?

Under normal New Zealand conditions there is rarely any need to feed supplementary minerals to milking cows. The mineral requirements, however, should be fully understood, as the dairy cow, particularly the high yielder, needs adequate supplies of lime, phosphoric acid, and chlorine.

Every gallon of milk carries away ¼ oz of lime, ⅓ oz of phosphoric acid, and 1/6 oz of chlorine. If the diet contains insufficient quantities of lime and phosphate, the amounts needed for milk production must be drawn from the bone reserves and this, if prolonged, leads to a decline in bodily condition and ultimately to a reduced milk yield. This should present no problem provided the calcium and phosphorus in the soil are kept at a desirable level (by topdressing if necessary) and stock are normally healthy. The local Instructor in Agriculture can be asked to take soil samples for laboratory analysis to check the calcium and phosphorus level of the soil and advise any necessary readjustment of the topdressing programme.

There is more than adequate chlorine in pasture to meet the milk-

DAD and DAVIES ON THE FARM



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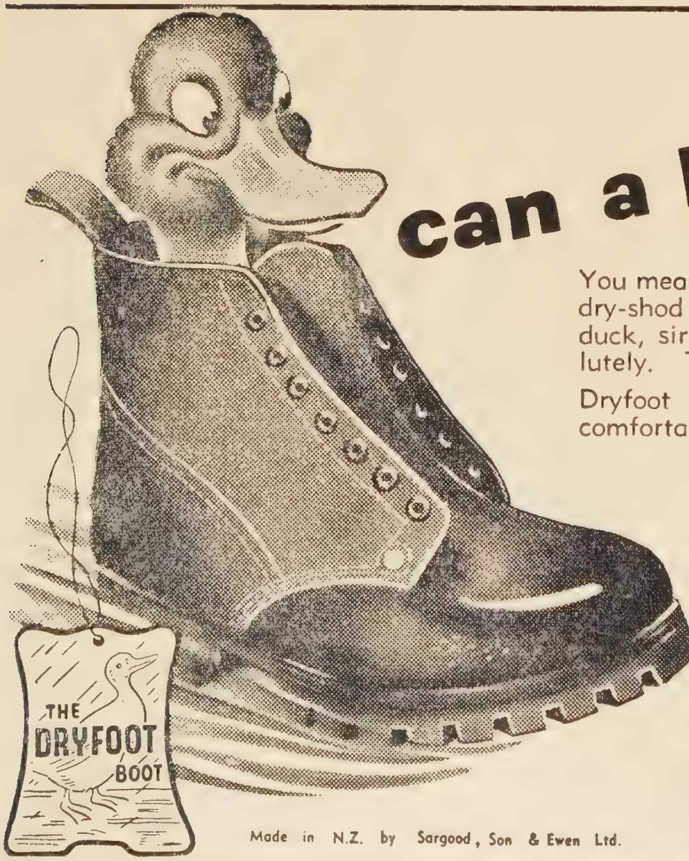

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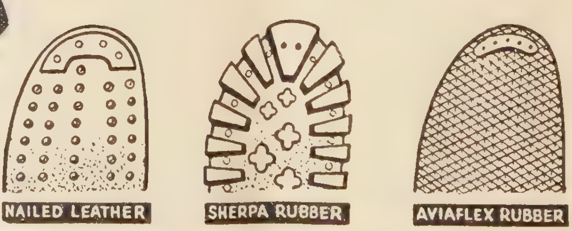

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D 9–1

ing cow's needs. If for some reason the intake of grass is reduced, a small quantity of common salt, say 1 lb to every hundredweight of concentrate, could be added.

Soil deficiencies in such minor elements as copper, cobalt, and iodine can affect stock health in New Zealand. However, if a herd is thrifty, the problem of a minor-element deficiency need not be considered. Most of the soils deficient in essential minor elements are well known to local Departmental advisory officers, who can make specific recommendations where necessary.

How to Purchase

It is not easy to compare feedstuffs, because there are so many factors to be considered such as price, palatability, suitability for long storage, whether material needs treating, and so on. The best measure of the relative productive value of feedstuffs is their energy value and protein level.

The energy value of any feedstuff is referred to as the starch equivalent (S.E.). The starch equivalent is the unit used by British countries as a guide to feeding value. Bran, for example, has a starch equivalent value of 40. This means that every 100 lb of bran fed would be equivalent in productive value to 40 lb of starch.

Comparative figures for feedstuffs can be obtained by dividing the price per ton by the starch-equivalent figure. For an actual example of bran at £21 per ton and barley at £25 the position would be:

Bran costing £21 a ton has a starch equivalent value of 40.

$$\frac{420\text{s.}}{40} = 10\text{s. } 6\text{d. per starch equivalent unit}$$

Barley costing £25 a ton has a starch equivalent value of 71.

$$\frac{500\text{s.}}{71} = 7\text{s. } 0\tfrac{1}{2}\text{d. per starch equivalent unit}$$

At these prices barley is the cheaper food.

TABLE 1—UNITS OF ENERGY AND DIGESTIBLE PROTEIN IN 100 LB OF FEEDSTUFFS (TYPICAL FIGURES)

	Starch equivalent (energy value) lb	Digestible protein lb
Barley	71	7.5
Bran	40	7.5
Brewers' grains (dried)	48	13
Coconut meal ..	74	15
Copra oil meal ..	75	16
Hay (good)	40	8.5
Hay (average) ..	30	4.5
Linseed cake ..	73	25
Maize	77	7.5
Molasses	52	1.0
Oats	60	7.5
Peas	70	18
Wheat	71	7.5

The data given in Table 1 show that barley, wheat, and maize, if of good quality, will supply 75 per cent more energy per unit of weight than New Zealand bran. The food value of bran is no better than that of good hay. (New Zealand pollard is only slightly better than bran.) The cereals barley, wheat, maize, and oats are low in protein. Copra and peas have a moderately high protein content, linseed cake is a rich source of protein, and all three have a high energy value.

The cereals are low in calcium and vitamin D (except yellow maize), but are rich in phosphorus. Bran is perhaps one of the richest sources of phosphorus of the common feeds, but is low in calcium, vitamin A, and vitamin D.

TABLE 2—PROTEIN LEVELS IN COMMON FEEDSTUFFS

High	Medium	Low
Buttermilk (dried)	Beans	Barley
Linseed	Brewers' grains	Bran
Skim milk (dried)	Coconut meal	Maize
Meat meal (rarely used in dairy rations due to unpalatability)	Copra	Molasses
	Lucerne meal (good)	Oats
	Peas	Wheat
	Seed offal	
	Sweet lupin meal	

Proprietary Dairy Rations

Normally, the only information available to the purchaser of a proprietary dairy ration is the price, the list of ingredients (not the percentage of ingredients), and the chemical analysis.

Care should be taken when comparing chemical analyses, as these can be misleading as a measure of feeding value. The percentages of carbohydrate and protein in a first-class dairy ration and in dung or old boot leather may be similar. The carbohydrate figure in the chemical analyses gives no indication of digestibility. The protein figure given is a measure of crude protein and this figure is higher than the true protein level and the digestible-protein level. However, as there is no alternative protein figure available, it serves as the only basis for the comparison of protein levels.

If it is possible, find out the actual percentage of ingredients in a proprietary ration. Then the total starch-equivalent value and the digestible-protein levels can be calculated. However, as the percentages of the ingredients of most proprietary dairy rations are not available, it is usually impossible to estimate the feeding value. If the ration has not been finely ground or pelleted, an experienced farmer may be able to judge the approximate percentage of the various ingredients and to estimate the feeding value.

Because of these facts it is virtually impossible to make a comparison between the food value of two different proprietary rations at different prices.

Under the Stock Foods Act dairy concentrate rations must comply with certain standards. There are clauses in the Act for the protection of the purchaser. For example, section 5, clause 1, states:

> 5. (1) Subject to the provisions of this section, every vendor shall, at the time of the sale by him of any stock-food, or as soon thereafter as is reasonably practicable, deliver or post to the purchaser an invoice containing the following particulars:
>
> (a) The name of the vendor and the name of the place in which the vendor carries on business:
>
> (b) The name of the stock-food and the trademark (if any) used in respect thereof:
>
> (c) The number of packages (if any) of the stock-food comprised in the sale:
>
> (d) The gross weight of each package of stock-food comprised in the sale:
>
> (e) Where the stock-food contains more than one ingredient, the name of each of the ingredients:
>
> (f) Such particulars of the chemical composition of the stock-food as are specified in the second column of the First Schedule to this Act in relation to the class, as specified in the first column of that Schedule, to which the stock-food belongs.

Main Points

● As concentrate feeding is expensive, a high standard of management is necessary to ensure a profitable return.

● A farmer should consider all aspects before feeding concentrates on a large scale. This includes the possibility of increasing disease.

● Under the New Zealand grass-farming system balanced concentrate rations are not required, but rather supplementary rations to make up crop and pasture deficiencies. A simple concentrate ration is generally sufficient.

● In general, the main requirement is energy; protein is rarely important for milk production.

● Purchasing should be done mainly on food value, using the starch-equivalent system.

● Unfortunately, there is a lamentable lack of information about the feed value of many proprietary dairy rations and their ingredients.

The Future

In many overseas countries concentrates form a major part of the animal diet, but in New Zealand their role is a very minor one.

When dairy farming becomes intensive because of a substantial increase in population, there may well be a swing toward more concentrate feeding, especially on town milk farms close to large cities.

References

"Concentrate Feeding of Dairy Cattle", L. R. Wallace, "Proceedings of the 1957 Ruakura Farmers' Conference", published by the Department of Agriculture.

"Concentrate Feeding in a Dry Summer", Professor I. L. Campbell, "Massey Agricultural College Dairyfarming Annual 1955".

"Rations for Livestock", H. E. Woodman, Bulletin No. 48, British Ministry of Agriculture and Fisheries.

"Journal of Agricultural Science", 51 : 95 (1958), J. L. Corbett and A. W. Boyne.

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Docks were completely cleared from this pasture (see photos at left) at a cost of only £2 per acre, by spraying with Shell Weedkiller "L". Lucerne and clover crops being grown at the time were not affected

One of the outstanding advantages of the new range of advanced hormone weedkillers introduced by Shell is the number of formerly "hard-to-kill" weeds, such as docks, which have now been brought under control. Docks in pastures should be sprayed with 4½ pts. of Shell Weedkiller "L", with a minimum of 12 gals. water per acre. This will kill broad leafed and curled docks in the seedling stage. Older docks will be checked but will require repeat applications before being completely eliminated. Shell Weedkiller "L" also kills or controls a wide range of annual and perennial weeds, including fathen, nettle, thistles, and plantains. Clovers and lucerne are resistant.

DOCKS IN CEREALS—Docks in cereals can be controlled, without setting back the crops, by spraying with Shell Weedkiller "M" according to directions and at the times stipulated on the label of the tin.

DOCKS IN PEAS, YOUNG PASTURES AND UNDERSOWN CEREALS—Shell Weedkiller "P", another highly selective weedicide, is recommended for the control of docks and many other weeds in peas, young pastures and delicate cereals.

Full details and further information regarding recommended hormone weedkillers may be obtained from your usual supplier or from the Shell Agricultural Division, P.O. Box 2091, Wellington.

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Safety Rules Necessary to Avoid Accidents with Explosives

PROPERLY treated, explosives are safe, but in careless or inexperienced hands they can be very dangerous and can cause needless death and destruction. Farmers who use explosives should remember at all times that they are dealing with dangerous materials and that there are a number of safety rules which should be observed when handling them.

WHEN accidents are caused because the operator delays too long in lighting the fuse they are often referred to as "premature" blasts, but in reality they happen because of non-observance of the fundamental rules of safe blasting practice and through failure properly to gauge the time taken in lighting the fuse and the time left to reach a place of safety. The safety fuse sold in New Zealand has a burning speed of 90 seconds per yard with a tolerance either way of 10 seconds.

Proper Handling of Detonators

Detonators should be handled only by those who understand them. In all other cases the rule is "Don't touch them". To those who use detonators in the course of their work the "don'ts" are:

- Don't leave them lying round, but lock them in the magazine.
- Don't take them home.
- Don't carry them in your pocket.
- Don't leave them where children will find them.
- Don't put them near a flame or fire.
- Don't knock them with a hammer or a stone.
- Don't pick sawdust from them with a pin, nail, or pencil.

Accidental Drilling into Explosives

Accidents due to drilling into explosives are more likely to occur in large-scale blasting operations, such as in quarries, roading, and hydro-electric development schemes, but as a rule, small operators should never drill into an unexploded charge, nor use any metallic equipment which could come into contact with the explosive.

Premature firing of electrical blasts can occur when precautions are not taken by the shotfirer to ensure that the current cannot be applied accidentally or by someone else. No electrical blasting operations should be carried out during a thunderstorm or when one is imminent, because lightning can cause premature blasts.

Guarding Approaches to Blast

When blasting is in progress see that all possible approaches to the blast are well guarded so that anyone approaching the area may be warned. Smoking or the use of naked lights must not be allowed when explosives are being handled or when work is being done near them. Black powder and detonators are particularly susceptible to premature initiation by spark or flame. Take special care to keep explosives and detonators dry.

When firing a round of shots with safety fuse make sure that the method of lighting allows time for the full number of shots to be ignited and that the fuse lengths are adequate for a safe getaway. See that the fuse is not damp and that it is not damaged during stemming. When crimping plain detonators on to safety fuse make sure that the fuse is in contact with the detonator composition, but never force or screw the fuse. Never crimp the detonator tube on the part which contains the detonator composition. The crimp should be about ⅛ to ¼ in. from the open end of the tube.

When inserting the primer cartridge in the bore hole see that the wires are straight, and if there are kinks, untwist them gently. To jerk them out may break the fuse and cause a misfire.

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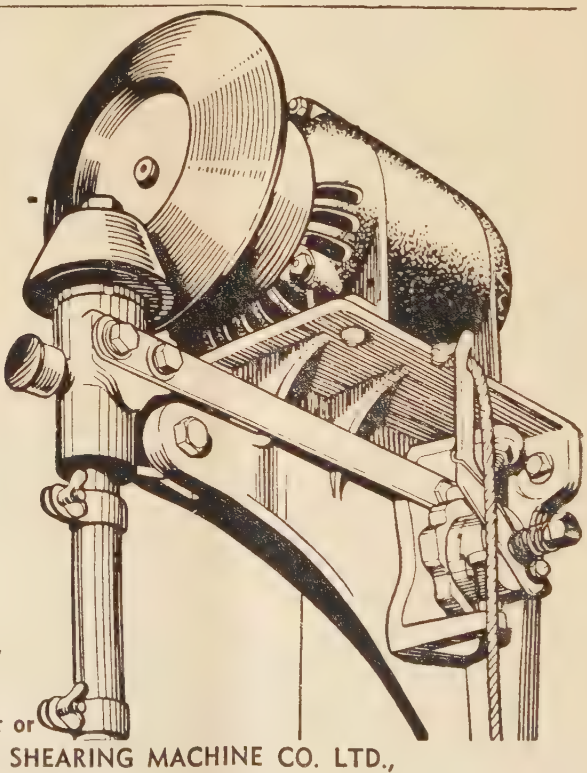

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The Home Orchard in Spring

By D. W. McCALLUM,
Horticultural Instructor,
Department of Agriculture,
Blenheim

[*Sparrow*

PROSPECTS are good in the home orchard in spring with the renewal of growth and the blossoming of plants, but fungus growths are also stirring and some of these send up spores which can cause serious plant disease. One such fungus causes a disease called black spot which attacks apples and pears and which is discussed in this article. Suggestions are also made for routine work in spring.

BLACK spot of apples and pears is one of the more serious diseases in New Zealand orchards. Commercial orchards obtain reasonably good control, but only by constant vigilance and with the use of a considerable amount of spray material.

For the home orchardist control is more difficult because generally spraying is done at the weekend and one or two wet weekends can restrict application and the disease becomes established.

The life cycle and the optimum conditions for infection must be known for a control programme to be worked out.

Black spot is caused by a fungus (*Venturia* spp.). As with most fungi it goes through several stages in its life cycle. In spring spores are released from infected leaves which fell to the ground the previous autumn.

The spores land on young leaves and developing fruits and if moisture is present, they will germinate and invade the tissue. The lesions formed can be seen and if infection is severe, several spots may appear on a leaf and, as they develop, grow together, forming a large mass of dead tissue.

Sometimes the leaf stalk is affected and small cankers are formed, causing premature leaf fall.

The most obvious signs of infection are visible on the fruit. Any part may be affected, but generally the spores land near the calyx (the end farthest from the stem), as this is the most exposed area.

As the spores germinate and enter the cells of the fruit, they form a characteristic olive coloured more or less circular patch. This patch is surrounded by a dark margin.

Fruit infected early is almost certain to be severely malformed and will probably drop. Infections developing as the fruit matures will be smaller and malformation is much less or even non existent.

When selecting control measures the orchardist must consider several points:

1. Infection may occur at any time after bud movement in spring. It has been found on flower petals.
2. Moisture or humidity favours the germination of spores.
3. The fungus can overwinter on trees as well as on fallen leaves.

These facts show that early spraying is necessary to kill the overwintering fungus on the trees and to provide a protective coating before spores are released from fallen plant debris or from the tree itself. As infection can take place at any time during late spring and summer, this protective cover must be maintained at all times when infection is likely to occur.

Control is based on fairly strong sprays at green tip, one or two further sprays before full bloom, and by considerably weaker sprays after petal fall. When necessary these later sprays should be repeated at intervals no greater than three weeks until about three weeks before harvest.

Spray Materials

All sprays and dusts used for plant protection should be kept well out of the reach of children. Even if a material is not labelled as poison, unpleasant results are likely if it is consumed or if concentrated material gets on the skin.

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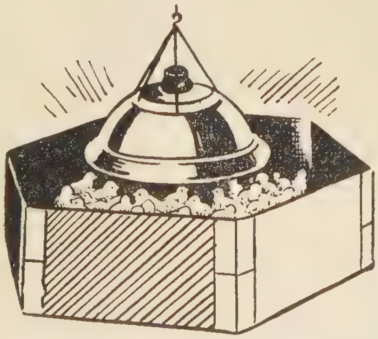

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Materials which have proved satisfactory in preventing black spot are:

Bordeaux Mixture

Bordeaux mixture has been the standard spray for black spot for many years. Applied as a green tip spray on both apples and pears it provides a sound foundation for control and may be followed by any of the materials listed below.

Colloidal Copper

Colloidal copper is quite effective and easier for home gardeners to mix than bordeaux mixture.

Captan and Thiram

Sprays based on captan and thiram are available in packs suitable for home gardeners. They have proved effective against black spot, especially when preceded by a bordeaux or a strong lime sulphur spray at green tip. Captan has proved particularly satisfactory on pears.

Lime Sulphur

As with bordeaux lime sulphur has been in use for many years. The great advantage it has over the other materials mentioned is that it gives a very good control of mildew as well as block spot. With pears this does not matter, as mildew does not affect them.

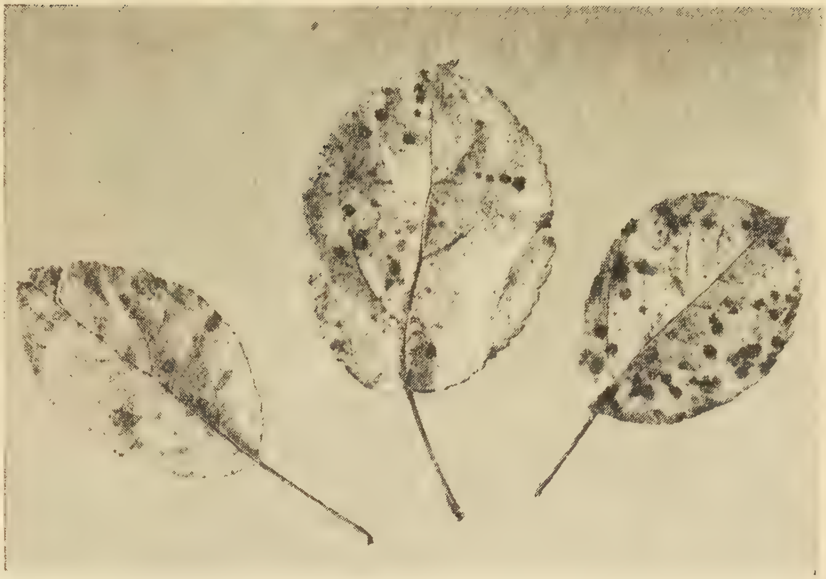
Apples can be very seriously affected, especially in the relatively low rainfall areas such as Central Otago, Canterbury, and Marlborough. Hence the wider range of diseases controlled by lime sulphur well justifies its use. However, it is a harsh spray on foliage and fruit and some russeting may occur, but this does not affect the flavour or, unless severe, the keeping quality of the fruit.

Black spot infection varies between districts and spray programmes must be varied accordingly. Growers who are not sure of the best sprays to use should consult the nearest Horticultural Instructor for more detailed information on control measures.

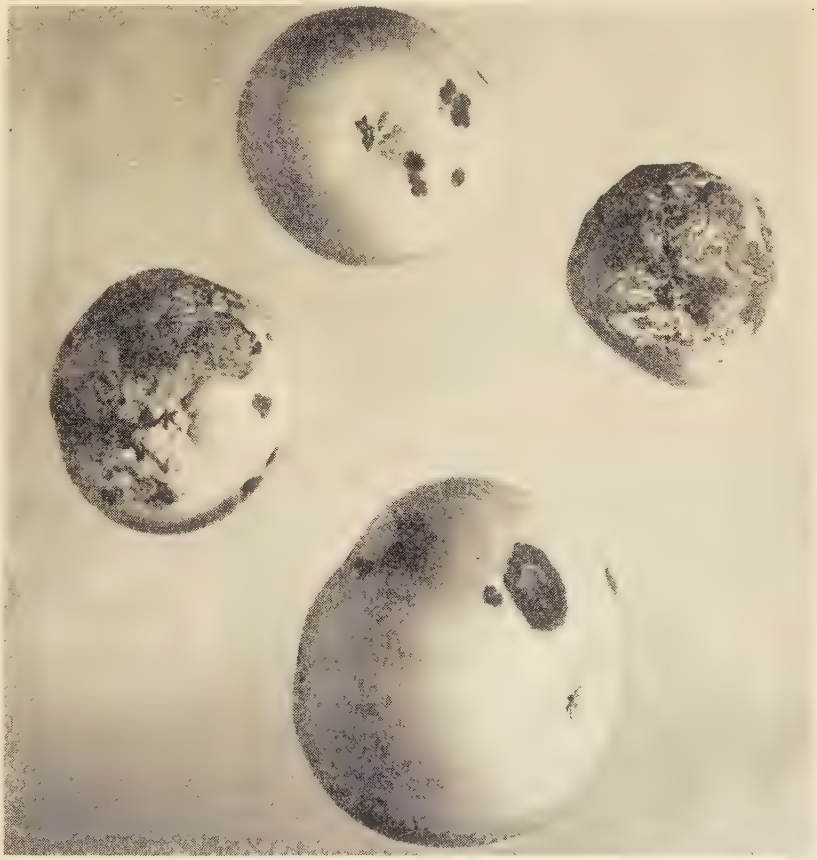
ROUTINE WORK

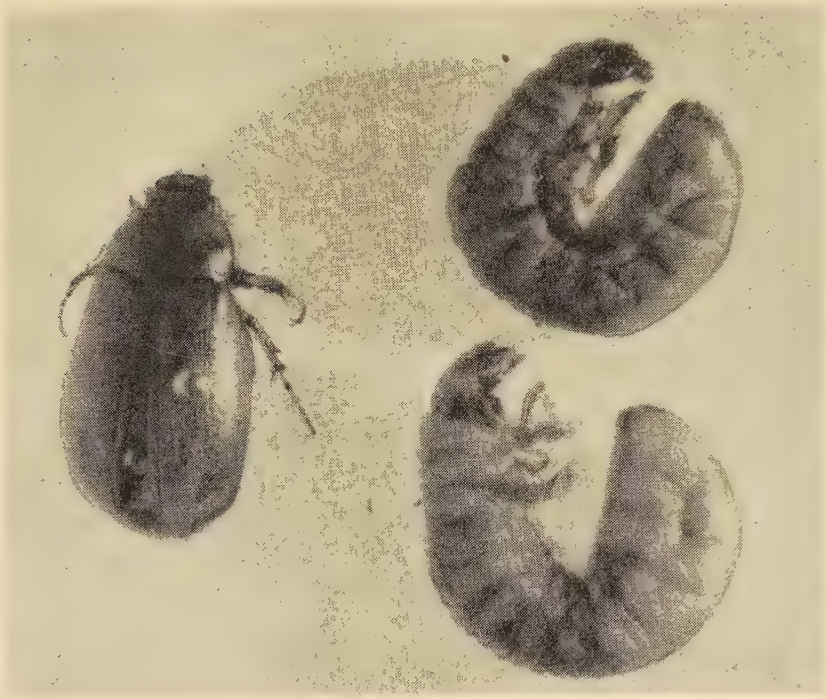
In spring precautions should be taken against dry conditions which may develop later in the season. Weeds should be eliminated, as apart from inducing unhygienic conditions they draw heavily on water and nutrients from the soil. In winter this is not important, but when active growth of fruit trees and berry fruits starts in spring the demands made by plants are considerable and competition should be reduced to a minimum. Grass round trees in lawns should be kept well cut.

Mulching will assist in conserving moisture. A 2 or 3 in. layer of organic material such as sawdust, straw, or cut grass will reduce moisture loss by evaporation from the soil surface.



Black spot on apple leaves and apples.





The grass-grub beetle (left) damages foliage and fruit and grass-grub caterpillars (right) eat the roots of many economic plants.

Weeds will be reduced and the need for frequent cultivation eliminated. With some surface rooting fruits such as strawberries mulching can mean the difference between success or failure of the crop.

Of recent years the use of a polythene film as a mulching material in home orchards has shown some promise with strawberry growing.

Mulches of any sort should be applied early and left all summer. Mulching encourages surface rooting and removal of the mulch during dry weather would check the plants severely.

Berry Fruits

The extensive fibrous root system of berry fruits is most attractive to grass grub (*Costelytra zealandica*). Because they feed under the soil surface, the damage they cause is not immediately obvious. Wilting of plants, lack of vigour, and reduced cropping are frequently the result of grass grub damage and a search in the soil round the roots of the plants will often reveal the small whitish caterpillar which is about 1 in. long when mature, has a dark coloured head, and is usually curled up. In spring this caterpillar pupates and about November the brown beetle emerges and is on the wing during twilight in November and December. During this flight periods it feeds voraciously on the foliage of many economic and ornamental plants and lays eggs which hatch into grass grubs.

Spraying the plants with DDT will kill many of the beetles. It is also necessary to treat the soil with DDT to ensure that the caterpillars are killed as they hatch out. One and a half pounds of 50 per cent DDT is sufficient to treat 1,000 sq. ft. This quantity is too small to obtain an even coverage if used alone and is best thoroughly mixed with sand or fertiliser before application.

Peaches and Nectarines

Brown rot is one of the more severe diseases affecting peaches and nectarines. Especially is this so in the higher rainfall areas. Though the most obvious symptoms are on the fruit, all parts of the tree may be affected, and a thorough spray coverage is necessary to ensure control.

The most critical periods for developing fruit are over the blossom period and during the four or five weeks before harvest.

Suitable spray materials to give control are lime sulphur and proprietary lines based on captan or thiram.

Spraying will be more effective if the fruit is thinned early so that no two fruits touch as they develop.

Apricots

Until recent years brown rot control by spraying of apricots was limited to pre-blossom bordeaux sprays. Materials then available were frequently toxic to bud, leaf, and fruit development. Recent experimental work has shown that spray materials based on thiram give good control of brown rot and do not adversely affect the tree. As with other stone fruit spraying is unlikely to be effective unless crop hygiene is good. This includes adequate thinning.

Book Review

"Fertilizers for the Farm and Garden": L. J. H. Teakle and R. A. Boyle

THIS book is written, it would seem, for intelligent farmers and market gardeners, teachers, and students in Australia.

It can be recommended for New Zealanders chiefly for the valuable summary of fertiliser experiments in Australia and for the chapters on fertiliser usage in that country.

The 80-page summary on fertiliser experiments covers a wide variety of crops such as cereals, fruit trees, vegetables, and also pines and pastures and the whole range of fertilisers from trace elements to nitrogen. It is followed by a 50-page discussion on fertiliser usage in Australia with clear and interestingly presented data on local consumption and production of fertilisers. It presents a bird's-eye view of fertiliser practices in individual states.

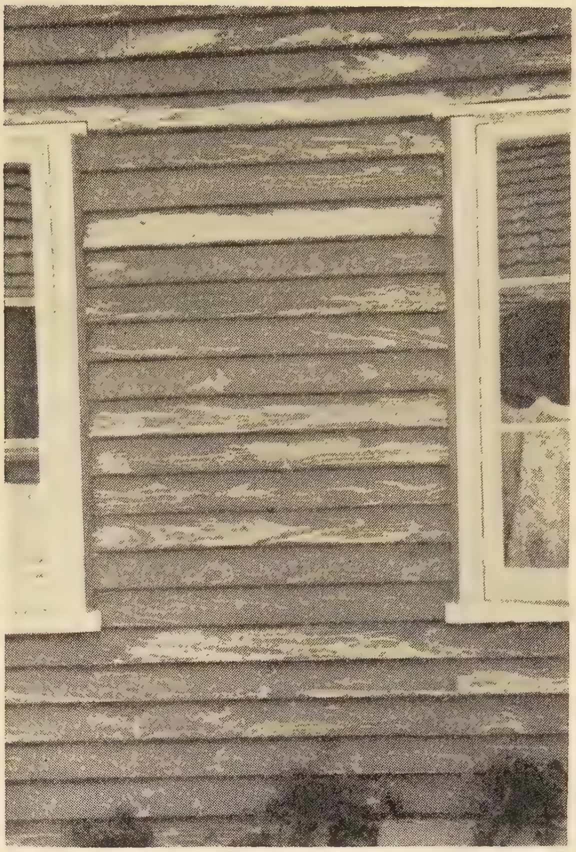
The book contains information on soil, plant, and fertiliser relationships and accounts of relevant field experiments in terms the layman would understand. Phosphatic, potassic, and nitrogenous fertilisers as well as trace elements, their commercial forms, and their uses are dealt with adequately. The book is perhaps rather loosely organised, but there is an excellent index. A section tabulating detailed manuring recommendations for a wide variety of Australian crops completes the book.

—*C.D.*

Angus and Robertson, Sydney, 1958. (63s. Australian).

Preservation of Timber by Painting

By R. M. SINCLAIR,
Dominion Laboratory,
Department of Scientific and Industrial Research,
Wellington



Neglected maintenance results in deterioration of the timber.

WOOD exposed to the weather undergoes rapid changes in moisture content with accompanying shrinkage and swelling. This leads to disruption of the outer layers of wood fibres and the characteristic grey weathered appearance of timber so exposed. In addition more serious defects such as cracking and warping may occur. Thus, except with certain particularly stable timbers such as redwood and cedar, painting is essential to maintain the serviceability of the structure. Further, the weathered surface is seldom acceptable aesthetically, and paint, in addition to its protective value, permits sufficient variety of decorative effects to suit practically all tastes.

THE three main constituents of paints are the pigment, the binding medium, and the thinner. The pigment provides colour and hiding power; the binding medium binds the pigment particles into a coherent film or, in clear finishes, constitutes the final film. The thinner provides ease of application, but forms no part of the dry film, being lost by evaporation.

Types of paint are usually defined either by the principal pigment or the type of binding medium. Thus we speak of white lead paints which contain basic-carbonate white lead as the principal pigment or oil paints where the binder is linseed oil. The term synthetic is often loosely applied to paints with a synthetic resin as the binding medium. Today enamel-type paints for exterior woodwork are almost always based on alkyd resins.

While in recent years research has led to the production of a great variety of synthetic resins for use in paints, only oil paints and alkyd paints are of practical importance in relation to exterior woodwork.

The protective function of a paint film on wood may be largely ascribed to its moisture-excluding properties. No paint film is completely impervious to moisture, but a sound paint film does greatly retard changes in moisture content of timber exposed to alternate wetting and drying in the weather. A single coat of paint has low effectiveness in excluding water; though it may shed liquid water temporarily, it will readily permit the passage of water vapour. Thus a single coat of priming may serve to protect timber delivered to the building site against excessive wetting before erection, but will not prevent moisture in the timber from breathing out after erection.

When a paint film cracks or flakes off, its protective value is lost at that point and its useful life has ended. Repainting should not be delayed beyond this stage if deterioration of the timber is to be avoided.

Painting Practice on Timber

The traditional paint system for exterior woodwork comprises three coats—priming, undercoat, and finish. The functions of the three coats are briefly as follows.

Priming

This is the first coat which serves to seal the surface and provide a firm bond between the timber and subsequent coats.

Undercoat

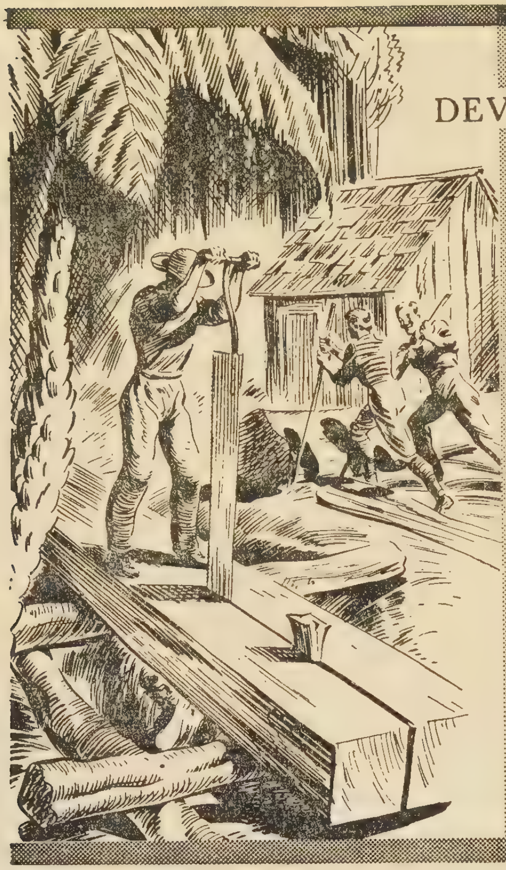
This coat serves to hide the underlying surface and assist in eliminating any minor imperfections. It should give a smooth and uniform surface suitable in texture and colour for the application of the finishing coat.

Finish

This is the final coat, which gives the desired characteristics of gloss, colour, and resistance to weathering.

In the days when labour costs formed a smaller proportion of the total cost of painting, four coats were not uncommon on new work. In the United States high labour costs led to the introduction of a two-coat system for exterior woodwork which is largely standard practice, but in New Zealand three coats are the generally accepted minimum.

There have been three phases in the evolution of house paints in New Zealand. First came the pure white lead paints mixed on the job from paste white lead-in-oil and linseed oil. The next stage was introduction of ready-mixed paints also based on linseed oil with a pigment mixture of white lead and zinc oxide and later a small proportion of titanium dioxide. At this stage, too, the inclusion of a



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proportion of the inert non-opaque pigments such as barytes and siliceous materials (extenders as they are commonly called) became common practice.

The latest stage of development has occurred in the last four or five years with the widespread adoption of enamel-type paints of the so-called "high-gloss" type. These are essentially alkyd paints pigmented in the lighter colours with titanium dioxide sometimes in conjunction with antimony oxide. Enamel-type paints on exterior woodwork have been used longer in the field of trim colours for sashes, sills, and doors, but then mainly in the deeper colours.

Types of Paint

Priming

For general-purpose priming of exterior woodwork the most widely used type is a pink primer pigmented mainly with white lead and a small proportion of red lead. Though not favoured in many overseas countries, pure red lead primers have many staunch advocates in this country. Comparative tests have failed to elicit any clear-cut advantage of red lead as against white lead primers, but the deep colour of the red lead primer at least ensures adequate thickness of succeeding coats to hide it.

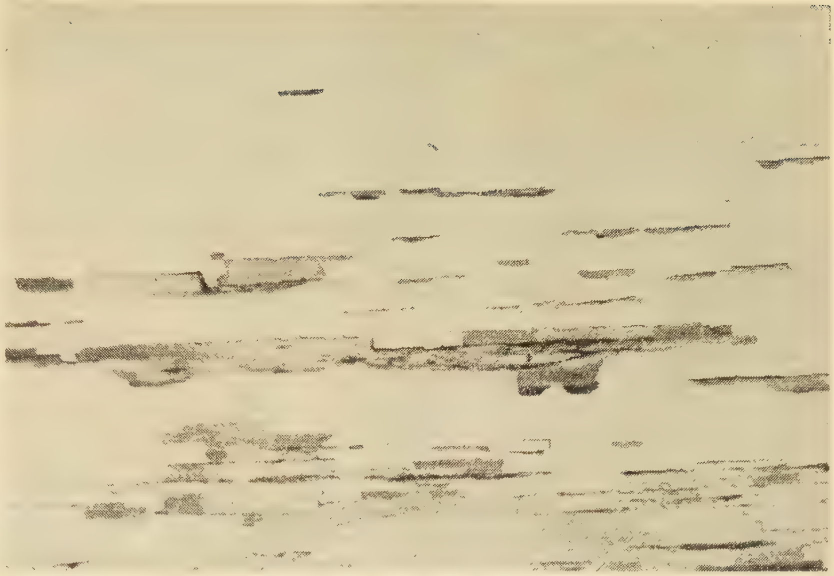
In certain localities, for example, Rotorua, where leadless primers must be used, primers are often based on zinc oxide and titanium dioxide and they may be used with similarly pigmented top coats.

Totara contains a resinous constituent which prevents the drying of ordinary oil-based primers, and so specially formulated primers have had to be developed for this timber. Totara primers should not be used on other timbers such as rimu, as they may give rise to premature flaking failure.

Aluminium primers for wood have not gained acceptance in New Zealand, though in the United States they are strongly advocated for timbers with poor paint-holding characteristics such as Douglas fir and southern yellow pine. Specially formulated aluminium primers have shown promise in tests on radiata pine.

Priming paints for exterior woodwork are covered by New Zealand Standard Specification 1056. The various types permitted are designated by code letters signifying the major pigment constituents; thus type LR priming is one which contains white lead and red lead, the first named being present in the greater amount.

Most wood primers are based on a simple oil-binding medium. A proportion of the oil may be bodied linseed oil to prevent excessive penetration of oil into the timber. Except for the special-purpose primers the use of varnishes in priming paints is not generally favoured.



Flaking on heart rimu primed with "totara primer".

Undercoats

Undercoats must be formulated to suit the particular finishing coat under which they will be used. It is common practice to make the undercoat of similar composition to the finishing coat but to adjust the pigment-oil ratio to produce a low-gloss finish that will provide a satisfactory key for the finishing coat. For example, in a white lead paint the undercoat is prepared by breaking down the paste white lead in oil with a mixture of oil and turpentine, whereas the finishing coat reduction is mainly with oil.

Undercoats for high-gloss paints are dealt with in the next section.

Finishing Coats

There are four main types of finishing coat:

1. Pure white lead paint.
2. Lead-zinc or lead-zinc-titanium paint.
3. Zinc-titanium paint.
4. High-gloss alkyd type paint.

The first named belongs to the era of the craftsman who mixed up his own paint on the job from paste lead-in-oil and is little used today.

The second group comprises the oil paints which were in widespread use for some 20 years before the advent of high-gloss paints and generally sold in ready-for-use condition or less commonly in semi-paste form.

The third group, also oil-based, has had fairly limited use and has often been supplied in semi-paste form.

Paint of the above two groups and their corresponding undercoats are covered by the New Zealand Standard Specification 521.

The fourth group comprises so-called high-gloss paints based largely on alkyd resins and pigmented with titanium dioxide of the rutile type. These may be used in conjunction with the undercoats supplied by the manufacturer. There is no standard type of undercoat for use with a high-gloss paint, but there is some evidence to suggest that for repaint work at least conventional oil-based lead-type undercoats are preferable to leadless or synthetic undercoats.

Preparation of Surface

The principal protective function of the paint film is to exclude moisture This obviously cannot be achieved if construction is defective and water can gain access to the timber through defective joints. This applies particularly to end grain of timber.

All timber should be properly dried before painting. Moisture contents in excess of 25 per cent will lead to flaking troubles and the timber should preferably be in equilibrium with the surrounding atmosphere.

Weatherboards are commonly primed before erection; the laps must be primed before erection, but if the face is also primed, there is no primer in the nail holes. If puttied in this condition, the oil will be drawn out of the putty into the wood and cause shrinkage of the putty. This may eventually lead to rusting of the nail heads and unsightly staining. All butt ends should be thoroughly primed and ideally should have two coats to prevent the ready entry of moisture along

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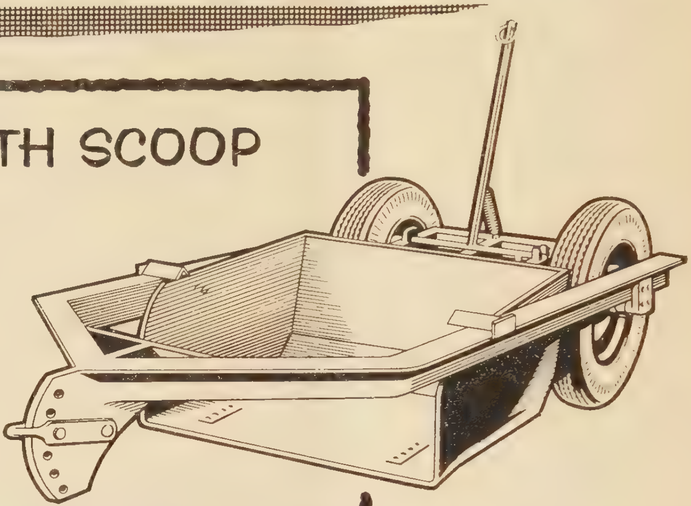

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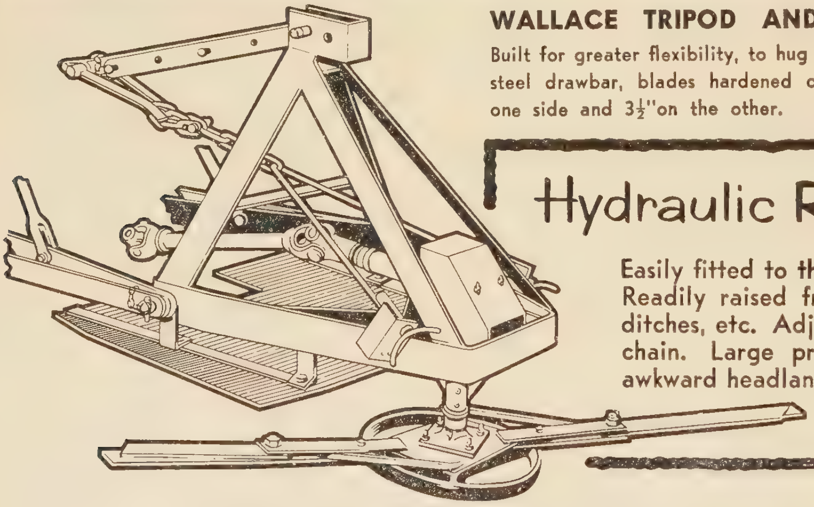

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end grain. Any cracks or defects should be puttied after priming. After priming and stopping, the surface should be lightly sanded down to remove minor irregularities in the film.

There is no certain method of preventing paint failure over knots, particularly in resinous timbers. Exudation of resin from knots will inevitably lead to embrittlement and cracking of the paint film. Differential shrinkage of the knot in relation to the surrounding timber often leads to cracking of the knot itself, which permits ready entry of water. Shellac sealer is of little value outdoors, as it promotes early failure of the paint film.

The priming coat should not be left exposed to the weather for long; more than a month is undesirable, as weathering of the primer will reduce the life of the completed paint system.

On repaint work the surface will normally be covered with a layer of adherent powdery material and this should as far as possible be removed by rubbing down and dusting off to provide a sound surface for the new paint. If flaking has occurred to any extent, it may be necessary to burn off the remaining paint and start afresh.

Alternatively old paint may be removed with solvent-type paint remover or a power sander. Small areas of flaking can be dealt with by feathering down the edges of the adjacent paint and spot priming any bare timber.

On sheltered surfaces, in porches, and under eaves dirt and salt deposits tend to accumulate and these should be washed down before repainting.

Though laborious, thorough surface preparation is essential if premature failures are to be avoided.

Typical failure of paint over knots.

Application Technique

Exterior house painting is usually done by brush and it is important that good-quality brushes be used. Cheap brushes with inadequate bristle do not hold paint well and do not have sufficient resilience to enable the paint to be well brushed out. Brushes may be kept soft by suspending them to the stock in raw linseed oil. The oil should be worked out of the brush before use. When one coat is to be changed to another the brush should be thoroughly rinsed out in mineral turpentine.

When the job is finished the brush should be cleaned in mineral turpentine and washed in warm soapy water until thoroughly clean; it should then be hung up to dry. When high-gloss paints, which set rapidly, are used rinsing out in mineral turpentine after each day's work is essential.

To obtain adequate durability the thickness of the dry film should be a minimum of five thousandths of an inch. This will be attained when the primer is applied at about 700 sq. ft. per gallon and the undercoat and finish at about 800 sq. ft. per gallon. Durability is roughly proportional to film thickness, but attempts to lay the paint on too heavily will lead to wrinkling and sagging.

To avoid the paint being "caught" by frost or dew, painting should preferably be done in the warmer part of the year. If the paint film is only partly set and is subjected to dew or frost, it may become dull and spotted. If painting is done in the colder part of the year, work should be discontinued in the early afternoon. Following the sun round the house is good practice.

Where the surface has been wet for prolonged periods superficial dryness may not be an indication that wood is in a fit state for painting. It should be allowed a day to dry out thoroughly.

Drying time allowed between coats will vary considerably according to weather, but each coat should be firm under moderate thumb pressure before the next is applied. Excessively long periods between coats is undesirable. Paint may become too hard and lead to lack of adhesion of the next coat.

Late summer is the best time for painting. There is some evidence to suggest that paint applied then has a longer life than paint applied in spring.

Choice of Paint System

The principal choice confronting the home owner today in painting his weatherboard house is between oil paint or high-gloss paint. The high-gloss type of paint has the advantage of improved gloss retention and colour retention over conventional oil paints.

Even after several years' weathering when the high-gloss paint is chalking quite freely and appears dull when viewed normally some of its brightness can be restored by washing down. With the oil paint all gloss is generally lost in the first six to 12 months and cannot be restored by washing down.

Though long-term experience of high-gloss paints is lacking, it seems likely that on new work they will last at least as long as oil paints. The degree of chalking that they show indicates that they will weather to a satisfactory repaint surface.

When applied over existing oil paints the performance of the high-gloss paints is less certain. They are more sensitive to the condition of the existing film than are oil paints. High-gloss paints should not be used if the coating to be repainted shows signs of lack of adhesion, nor should they be used if the timber has been neglected and sun cracks have developed in it or where considerable thickness of paint has been built up by successive repaints.

In such cases the successful use of high-gloss paints demands complete removal of the old paint and treating as for new work. The foregoing does not imply that oil paints can be successfully applied over paint that is flaking or generally poorly adherent; rather that high-gloss paints are prone to induce flaking before it is visibly conspicuous in the old paint.

Oil paints are available in lead-zinc or the zinc-titanium types. The latter is preferred for coastal areas, where lead paints are prone to discolouration, particularly on partly sheltered surfaces as in porches or under eaves.

Paints for use in thermal areas or where hydrogen sulphide may be present in the atmosphere from other causes must be lead free. A zinc-titanium (unless specifically manufactured for this type of service) may not necessarily meet this requirement.

Where repainting is being done with high-gloss paints the use of an oil-based undercoat is preferred. Synthetic undercoats may lack the necessary wetting characteristics required to bind down the weathered surface to which they are applied. In many cases the conventional lead-based undercoat will be suitable, but the individual manufacturer's recommendations should be followed.

Paint Maintenance

In general moisture, oxygen, and ultra-violet light are responsible for the breakdown of a paint film. Normal breakdown outdoors in the form of chalking or powdering of the film is a result of the combined action of these three agents. This arises from destruction of the binder and liberation of a superficial layer of pigment on the surface of the film.

In addition as the film ages it becomes progressively harder and less elastic until it reaches a point where it can no longer accommodate itself to mechanical stresses placed on it by expansion and contraction of the timber. Breaks develop in the film in the form of cracks and these may ultimately develop into flaking. The possibility of flaking occurring will depend on the adhesion of the film to the timber or the underlying paint film and the cohesive strength of the film.

The preferred form of film breakdown is by slow chalking and erosion, as this results in a surface requiring the minimum of surface preparation before repainting. Flaking failure usually necessitates extensive film removal before repainting and this is a costly procedure. The type of failure that occurs varies according to the type of paint and the climatic environment. Paints exposed in areas of high rainfall or prolonged high humidity tend to fail by erosion, whereas in dry climates subject to extremes of temperature cracking and flaking failures predominate.

The point at which repainting should be undertaken is difficult to define precisely. Repainting may be undertaken for purely decorative reasons, that is, the paint has faded or become dirty and shabby looking. Mostly it is done when the paint has ceased to fulfil its protective function. At the first signs of exposure of the wood or development of cracks the paint should be renewed. If delayed beyond this point, the cost of renewal is likely to be much greater.

Ideally, the thickness of paint applied should balance that lost by weathering so that five thousandths of an inch is maintained but not greatly exceeded. Lead paints are tolerant to the building up of a substantial thickness of paint over the years without showing abnormal failure. High zinc paints are more prone to develop cracking and flaking failures under such conditions. Oil paints may be successfully maintained by the applying of a single finishing coat every three to four years or two coats every five to six years.

Maintenance of high-gloss paints with a single coat of finishing paint is not recommended. An undercoat should always be used.

Summary

With weatherboard houses exterior painting constitutes the largest single item in the cost of maintenance. It is therefore of considerable importance to obtain the maximum possible life from the coating.

Satisfactory results will be obtained only by careful surface preparation before painting, proper application, and choice of a suitable type of paint. A planned maintenance schedule will assist in preserving the building in a sound condition. Repainting should be carried out before the coating deteriorates to such an extent that the wood is subject to weathering. Where a particular type of coating has been previously found to give good durability it is wise to continue using the same type of paint.

Recommendations for Grass Grub Control

DDT is the best insecticide for control of grass grub and the logical way to apply it is with super-phosphate as DDT/superphosphate. The recommended rate is 2 lb per acre of 100 per cent para para isomer (p.p.i.) DDT.

Fertiliser works usually prepare two mixes, one of 40 lb and the other of 20 lb of 100 per cent p.p.i. DDT per ton of superphosphate, 40 lb being for those areas where the annual superphosphate requirement is 1 cwt per acre and 20 lb for areas having a 2 cwt per acre superphosphate requirement. Each will supply the required 2 lb of 100 per cent p.p.i. DDT per acre, which should give good control for three years.

For best results, rules which should be followed strictly are:

The DDT/superphosphate should be applied as an insurance against attack rather than after damage is done.

It should be applied to short grazed, dry pasture.

Stock should be kept off the paddock until sufficient rain has fallen to wash the mixture off the pasture on to the ground.

Even distribution is absolutely essential.

Ground application is the most satisfactory.

Spin and blower type topdressers are not satisfactory for a swath over 18 ft wide.

Aerial application is satisfactory only if the wind velocity does not exceed eight miles per hour, the aircraft does not fly higher than 12 ft, and the swath is not more than 20 ft wide.

Only wet-mix DDT/superphosphate should be used for aerial application, because in the wet mix DDT is incorporated thoroughly during manufacture. The dry mix is mixed mechanically and the relatively light DDT can be separated and blown away if applied from the air.

—*A. J. COUGHLAN,*
Fields Instructor,
Department of Agriculture,
Hastings

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Water and Shade Will Prevent Losses from Dehydration

Dangers to Young Stock in Unusually Hot, Dry Weather

IN two recent summers there were spells of unusually hot, dry weather in various parts of the country during which or immediately after which deaths were reported in lambs that had been handled. Excessive loss of body fluids because of the dry heat, aggravated by moving or handling the animals, was found to be the cause. Circumstances leading to losses are discussed in this article and precautions recommended to avoid their repetition in another hot summer.

By D. H. LE SOUEF,
Livestock Superintendent,
Department of Agriculture,
Dunedin

Lambs seeking shade. The one at extreme right is recently dead and the one next to it has sunburn on the face.

DEATHS that occurred in the South Island at the end of 1955 and appeared again early this year were first attributed solely to drenching with phenothiazine, as almost all affected animals had been treated with this drug. However, investigations by officers of the Department of Agriculture revealed that deaths occurred in young sheep that had been drenched with the bluestone-nicotine mixture and not phenothiazine and that some sheep that had been shut up for crutching or some other reason and not drenched at all had also died. This led to the theory that deaths were due to dehydration, and experimental work was carried out at Wallaceville Animal Research Station.

During very hot weather in countries where the climate is normally temperate deaths occur among infants (as was reported last summer from Melbourne) due to collapse, as a high proportion of body fluids and salt is lost by perspiration and evaporation. Lambs, especially fat and quickly grown ones, contain a higher proportion of fluids in the body than do adult sheep, as any housewife will know after cooking a roast of spring lamb, so that in very hot weather water as such, or in the form of lush feed, is required in increasing quantities as the heat rises.

Under natural conditions animals tend to seek shade and lie quietly during the hottest part of the day, grazing in the early morning and evening, so that they conserve body fluids. However, the balance is delicate and any abnormal movements such as droving and yarding, even at the cooler times of the day, can upset this balance and the lamb will find it difficult to replace the lost fluids, as it takes time for water to be absorbed and pass into the bloodstream and thence to the tissues.

Phenothiazine is the most effective drug we have against the common internal parasites of stock, but it has properties that may be harmful to the treated animals as well as the worms. One of these properties causes photosensitivity; hence lambs or calves subjected to bright sunshine soon after drenching may show symptoms of blindness and sunburn on the barer parts of the head or limbs and often injure themselves seeking shelter in gorse hedges. Another property causes irritation and inflammation of the kidneys.

These factors added to upset caused by yarding and holding, even for a few hours without food or water, are sufficient to tip the scales against the animals and rapid loss of condition, followed in many cases by death, takes place. On some farms where lambs were suffering from dehydration these rigorous conditions had been further accentuated by weaning, which deprived the lamb of the few ounces of milk the ewe might still have been giving. Most farmers were able to turn lambs on to good feed after treatment, but some lambs went on to fair but dry pastures without either water or shade and the results were pitiful.

The misery that can be inflicted on lambs and the loss owners may suffer, mainly through ignorance, in a hot season are apparent. It is frequently said that lambs fatten well in a hot summer, and they do, up to a point.

Though weather threatening the conditions described may occur in a particular district only once in several years, it is worth while making provision ahead for:

- A good water supply, in at least some paddocks.
- Ample shade—trees, native bush, or even open sheds.

When very hot weather occurs do not **wean, drove, yard, hold, crutch, or drench** lambs in high condition. Even if a cool change occurs and rain falls, it is still not safe to drench or otherwise treat lambs for a few days. Scouring does not usually occur under dry conditions. If it does, it may not be due to worms, so that under these circumstances, it is wise to have a check made for parasites by a veterinarian.

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The Home Garden in September

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

SEPTEMBER or October, according to district, is the most favoured month for sowing hardy main-crop vegetables. Whether September or October is favoured depends on temperature and condition of the soil, but sowing in cold or poorly aerated soils should be avoided.

CARROTS are one of the most important and popular vegetables because of their nutritional value, flavour, and long period of availability, but many home gardeners have difficulty in growing satisfactory crops. Apart from the need of a well cultivated, highly fertile soil, one reason for the lack of success is that seed does not germinate well in cold conditions and in wet soil seedlings are likely to damp off owing to fungous diseases. Where drainage is poor and soil conditions are cold, a raised bed is advisable. For convenience in cultivating and harvesting, the bed should not be more than about 3 ft wide.

SOW NOW

- Beetroot
- Broad beans (late sowing only where soils do not dry out)
- Brussels sprouts
- Carrots
- Cauliflowers
- Chinese cabbage
- Cress
- Celeriac
- Summer cabbage
- Kohl rabi
- Leeks
- Lettuce
- Mustard greens
- Onions
- Parsnips
- Parsley
- Peas
- Radishes
- Salsify
- Scorzonera
- Silver beet or Swiss chard
- Perpetual spinach beet
- Spinach
- Turnips

Where ground is well drained

Most other hardy vegetables

PLANT OUT

- Cauliflower
- Summer cabbages
- Jerusalem artichokes
- Lettuces
- Onion seedlings
- Potatoes (main crop in warmer districts only)
- Rhubarb (in colder districts)
- Shallots

UNDER GLASS

- Sow celery cucumbers, egg-plants, melons marrows, peppers, tomatoes
- Force kumaras to obtain rooted shoots

Early or late in September according to district and maturity requirements

[*Sparrow*

Soil for carrots should be of good texture. If it bakes or forms a crust after rain, emergence and growth of seedlings may be retarded.

Manuring

Soil heavily manured for the previous crop is best for carrots, and sandy or light loams are especially suitable for early crops. Much experimental work on the manuring and production of carrots has shown that for best results the soil must contain adequate phosphate, usually applied as superphosphate. Generally the application of potash is much less important, at least for early carrots, and only moderate amounts of nitrogen should be needed on most soils.

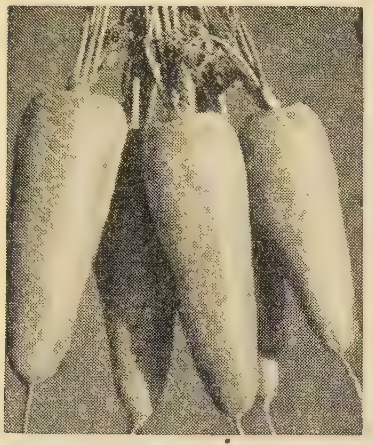
A fertiliser made up for instance by mixing (by weight) 2 parts of sulphate of ammonia, 8 parts of superphosphate, and ½ to 1 part of muriate or sulphate of potash usually gives good results. On most soils such a dressing should be applied at 2 to 3 oz per square yard. Carrots are fairly tolerant of acid conditions, but where a deficiency of lime is suspected it can be remedied on most soils by the application of 2 to 3 oz of lime per square yard.

Splitting

Splitting of carrot roots is a widespread trouble and generally is most prevalent in the stump-rooted varieties. Wide spacing, which also results in lower yields, tends to give a greater number of split and coarse roots, as also does excess nitrogen. Splitting is more prevalent in dry conditions and with early sowing or when the roots are left relatively long in the ground.

Soil Conditions

Soil for carrots should be of good texture. If it bakes or forms a crust after rain, emergence and growth of seedlings may be adversely affected. Heavy soils on which growth is comparatively slow tend to produce thick, short carrots with greater core development and inferior table quality than do lighter, more free-working soils.



FARM GROWN VEGETABLES

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Farmers can have household vegetables "field fresh" at practically no cost. When sowing the seed of your crop—perhaps Chou Moellier or Turnips—and at some convenient part of the field, just feed into a few coulters of your drill the desired vegetables or other seeds for a short run. Stick to popular straightforward crops that suit your soil and district climate. Some suggestions are listed below; and most important, insist on Yates Reliable Seeds. Do not worry about waste or having too much produce—your stock will enjoy any surplus.

SUGGESTIONS

CABBAGES
SILVER BEET
BEETROOT
CARROTS
PARSNIPS
PUMPKINS
MARROWS
SQUASH
SWEET CORN
PEAS and BEANS

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Trials with some popular varieties, Chantenay for instance, have shown that roots which are accepted as most typical of the variety are produced when the temperature during growth is about 65 degrees F. At 10 degrees lower roots are longer and thinner and at 10 degrees higher they are shorter and thicker.

Carrots vary in shape, colour, and size according to variety, but all these characteristics may be influenced by soil conditions. Soil influences size more than it does shape. Colour, too, varies considerably. The colour most desired by the housewife is usually red or orange-red and is a result of an accumulation of a substance called carotene. Carotene content is higher in some varieties than in others, but is also influenced by temperature and availability of plant food.

Irregular moisture supply and high temperatures bring about the development of a rough surface on the carrot. Horizontal depressions, which may be quite deep, on the root make its preparation for the table wasteful.

Sowing

Carrot seed should be sown thinly ¼ to ¾ in. deep, according to whether the soil is heavy or light, in rows about 12 in. apart. A quarter of an ounce of seed should sow about 100 ft of row.

If the soil is light and free, there should be no need to thin, but on heavier soils young plants can be thinned to about 2 in. apart. Thinning should be done preferably when the soil is moist so that the remaining seedlings are disturbed as little as possible. If thinning is delayed, the thinnings can be used for soups and stews.

Carrot seedlings are delicate and cannot compete with weeds or withstand drying out which may result from baking or cracking of the soil. Cultivation should therefore begin as soon as the rows can be distinguished. A little radish seed, which germinates quickly, is sometimes sown with some of the carrot seed to give an early indication of the position of the carrot rows.

Varieties

Good varieties include Chantenay, Taranaki Strong Top, Nantes, and Morse Bunching. Scarlet Horn is widely used where a quick-maturing carrot is wanted.

Leeks

Leeks are one of the most reliable vegetables for autumn, winter, and spring. Though they stand well in cool, moist conditions, they send up seed heads fairly quickly if subjected to dry, warm conditions. To ensure a long season of supply it is advisable to make two or three sowings.

Because of cool soil conditions the earliest sowings in most districts are best made in a box of prepared soil under glass. Seed can now be sown outdoors thinly ½ in. deep in rows 12 in. apart.

[Green and Hahn

Rhubarb can be readily forced by covering the dormant crowns with boxes or straw.

Varieties

London Flag or Broad Flag is a good variety for this sowing. It matures a little more quickly than either Musselburgh or Lyon.

Lettuces, Peas, Radishes, Turnips, and Salad Onions

Successional sowings of lettuces, peas, radishes, turnips, and salad onions may be made. These vegetables remain in the best condition for only a limited time and should be used when young and fresh. A well drained, deeply cultivated soil rich in humus is necessary, as quick, vigorous growth is essential for crisp, succulent produce. Seed of radishes, spring onions, turnips, and lettuces should be sown thinly ¼ to ½ in. deep in rows 12 in. apart.

When well through the ground lettuces can be thinned to 8 to 12 in. apart and turnips to 3 to 4 in. apart. Alternatively, lettuce may be sown in boxes in a frame and planted out when 2 to 3 in. high. Peas should be sown as advised in last month's "Journal".

Onions

In the South Island and in some North Island districts main-crop onions are usually sown in spring. Seed should be sown as soon as ground conditions are favourable. Though varieties and cultural practices have an important bearing on production, fairly heavy soils usually produce good-keeping but relatively slow-maturing onions and sandy soils quick-maturing onions that are generally of poorer keeping quality.

YOUR MARKETS OVERSEAS · NO. 2 OF A SERIES

MEDITERRANEAN MAGIC

It's hard to associate romantic-sounding ports like Piraeus and Genoa with such down-to-earth subjects as Trade, Commerce and Economics. But to many New Zealanders, the sheep, cattle and dairy farmers in particular, that is precisely what the association has come to be. Which explains the presence at these exotic places of New Zealand's refrigerated cargo ships.

For at these Mediterranean ports, frequent consignments of frozen meat, dairy produce, wool and other goods are unloaded. The volume involved is relatively small, but it could become considerably larger. New expanding markets for New Zealand's produce are always important.

And it is for this reason that the ships of the New Zealand Overseas Shipping Lines call at these ports as often as they do. At these and at many more besides: the West Indies, North and South America, South Africa, Europe—and, of course, the United Kingdom. Where there are possibilities of trade for New Zealand, there you will find our ships.

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Tomatoes under Glass

UNHEATED tomato glasshouses are planted according to district from August to early October. Soil preparation should be started in good time. Tomatoes rarely succeed if grown in the same soil for two years in succession, unless the soil is disinfected with substances such as formalin or chloropicrin (tear gas).

If the tomato house is very small, the soil can be taken out and renewed with good garden soil that has not recently grown potatoes or tomatoes. Soil on which grass has been growing is best. Alternatively, results are usually satisfactory if a heavy, well established green crop has been growing on it. Soil that has been down in grass or green crops for a year, or preferably two years in succession, is usually free from most of the diseases affecting tomatoes and in good physical condition; that is, drainage and aeration in it are good for that type of soil.

Disinfection Procedure with Formalin

Formalin is usually the most satisfactory substance for the home gardener to disinfect tomato glasshouse soil with. The common method is to have the soil in fine, friable condition—not wet, but not too dry—and to begin digging over at one end of the house, soaking along the line of digging after each successive spit or line of spits has been turned.

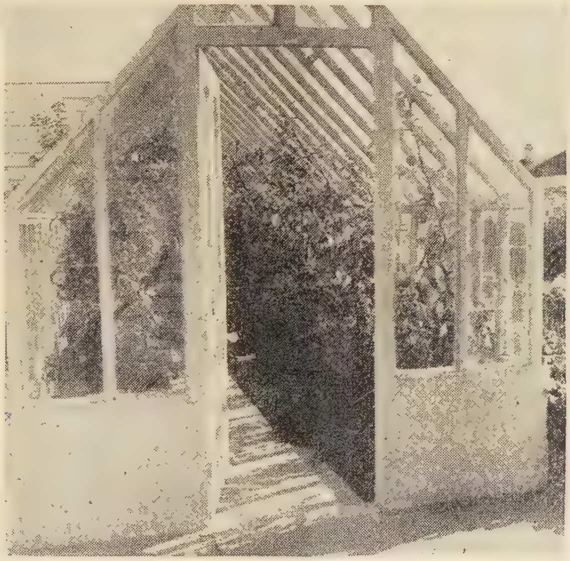
The formalin should be diluted at 1 gallon to 49 gallons of water and the 50 gallons of solution applied to each 10 to 15 square yards of ground surface according to the severity of diseases. For instance, where only minor root rots are troublesome or no disease has been noticeable the area covered could be about 15 square yards or perhaps a little more. Where serious disease, such as verticillium wilt, has occurred the measured amount of diluted formalin should be applied to 10 square yards or less.

Soil temperatures of 60 degrees F or higher are recommended, as temperatures must be high enough to make the formalin volatile and so disseminate it.

After the formalin has been applied the soil surface should be covered with wet sacks. It should then be left with the house closed for about 14 days, when the ventilators can be opened and the soil forked over to assist the dispersal of the fumes, which are toxic to plants.

Planting can begin as soon as all fumes have been dissipated from the soil and base fertilisers have been dug in. Dispersal of the fumes is likely to be delayed by low temperatures and wet, heavy soils and speeded by working of the soil and high soil temperatures.

Chloropicrin is not generally recommended for use by home gardeners, as a gas mask should be worn by anyone using it and an injector gun is advisable for satisfactory application.



A suitable type of small glasshouse for producing household supplies of early tomatoes.

Onions require a slowly available supply of nitrogen, and on most soils crops will benefit from a heavy dressing of well rotted stable or farmyard manure, preferably applied in autumn. If onions of good keeping quality are required, it is not advisable to apply in spring excessive quantities of organic manure which contains a considerable amount of nitrogen, as bulbs may be stimulated into excessive leaf growth and weeds are liable to be more troublesome.

Few home gardeners are likely to have much farmyard manure, but available compost should be applied with a complete fertiliser at about 3 to 6 oz a square yard. Because of the great variation in soils and their condition throughout New Zealand only local experience can indicate fertiliser requirements.

The seedbed should be worked down to a fine, firm tilth and seed sown thinly ½ in. deep in rows 12 to 15 in. apart.

Good varieties include Ailsa Craig and Straw Spanish (both early) and Pukekohe Long Keeper (for storage).

Parsley

To make sure of a good supply of parsley it may be necessary to sow seed twice a year, in spring and again in autumn. Parsley is a biennial, that is, it goes to seed the second year.

Parsley needs a rich, moist, well drained soil, and fertiliser should be dug in before sowing as advised for other long-standing crops. Blood and bone at about 2 oz to 3 oz per square yard usually gives good results.

Seed can be sown in rows or broadcast on a small plot, but for best results plants should be spaced about a foot apart when large enough to handle. They make quite a good edging and do well in cool, moist soil in the open or semi-shade.

Potatoes

It is too early in most districts to plant main-crop potatoes, though an early planting can be made if the home gardener is prepared to keep the tops earthed up while frosts are likely to cause damage. It is not necessary to green and sprout tubers before planting, but earlier crops can usually be obtained from sprouted seed.

Government-certified seed should be used if possible. Few vegetables are subject to as many diseases as potatoes, and only the expert can recognise many diseases in the tubers. Tubers infected with virus diseases, such as leaf roll, mosaic, and crinkle, may appear healthy and of a desirable type, yet if it were not for the system of certification, these diseases would reduce the total yield of potatoes in

New Zealand by perhaps a half or two-thirds. Virus diseases are transmitted mainly by aphids (green fly), the lower incidence of which in the South Island is the main reason for the growing of most of the certified seed there.

Apart from the purchase of certified seed, the important points in potato growing are choice of variety suited to the soil and district and the purpose for which the variety is grown (that is, early, second early, main, or late crop), soil condition, and cultivation.

Jerusalem artichokes are easy to grow. Their top growth (left) provides good shelter for other vegetables and the tubers (below) have a distinctive flavour. Tubers, either cut or whole, can be planted this month in the same way as potatoes. A permanent artichoke bed can be established simply by leaving surplus tubers in the ground from year to year.

[Green and Hahn photos

Soil can be maintained in good condition by the addition of humus or humus-forming materials, by the judicious application of fertiliser, by suitable rotation of crops, and by drainage where necessary.

Soil and Fertilisers

The soil for potatoes preferably should be deeply and thoroughly cultivated, as thorough preparation of the soil not only ensures a good seedbed but helps to maintain satisfactory moisture content, aeration, and temperature. Soils that have been trenched should be given time to settle before planting.

Heavy dressings of organic manure just before planting are not advisable, as they may induce conditions which favour the development of scab. A heavy dressing applied the previous year, so that it is thoroughly decomposed, or a green crop dug in some time before planting, will usually help to give satisfactory results, as also will the addition of such material as grass clippings.

Soils which have been heavily limed or heavily dressed with the ashes of the garden bonfire should not be used. The potato is tolerant of acid conditions, and in soils infected with common potato scab the organism will be suppressed if the soil is fairly acid to strongly acid. Lime increases the alkalinity of the soil.

The fertiliser required for potatoes depends greatly on the amount of organic matter previously incorporated in the soil, but generally Department of Agriculture trials in New Zealand have shown that a mixture (by weight) of 1 part of sulphate of ammonia and, according to soil type, 3 to 5 parts of superphosphate applied to about 1½ to 2 oz per yard of row will give good results.

The addition of muriate of potash or sulphate of potash, preferably the latter, at about ⅓ oz to a yard of row will give improved results on many soils and is advised for most home garden soils. Instead of superphosphate and sulphate of ammonia equal parts of superphosphate and blood and bone can be used.

Planting

The simplest way to plant is usually to open a trench about 4 to 5 in. deep and to dust the fertiliser along it. Home garden rows are usually 2 ft apart and tubers can be placed from 9 to 14 in. or 16 in. apart in the rows. The wider spacings are favoured for main-crop or very large growing varieties.

If tubers are large, that is, 4 oz or more, they can be cut into two or more sets if desired. Each should be chunky and have at least two eyes and a minimum of cut surface.

Cut surfaces should not be allowed to dry out, but should heal or callus over promptly. The pieces should be planted immediately they are cut in a soil that is neither too wet nor too dry.

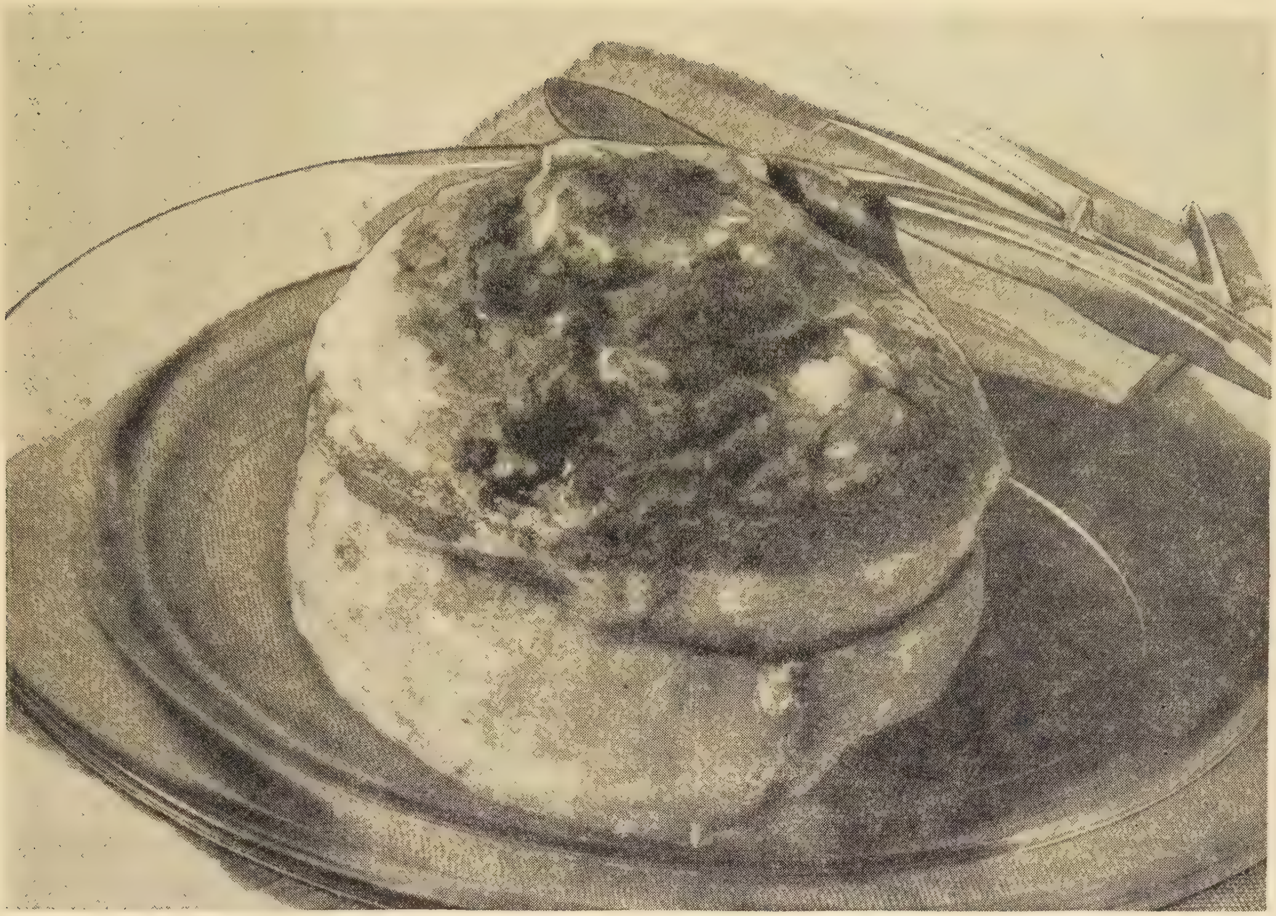
If soil conditions are not favourable, tubers can be cut and left with the cut surfaces in contact, though they should be broken apart from time to time. Alternatively they can be kept at a temperature of 60 to 70 degrees F and a very high humidity for about seven to 10 days. However, to prevent excessive sprouting temperature and humidity should be lowered as soon as healing is complete. Hygiene is also very important in handling cut tubers, as the tubers are liable to attack by soft-rotting organisms until the cut surfaces heal.

Though for early crops Epicure and Arran Banner are most commonly planted, numerous other varieties listed in good seedsmen's catalogues are suited to different districts. For example, Jersey Bennes is favoured in Otago.

Silver Beet (Swiss Chard) and Spinach Beet

Silver beet or Swiss chard and spinach beet do well in rich, well drained, and well cultivated soils. Seed should be sown, preferably where the crop is to mature, though seedlings can be transplanted. Rows should be 15 in. apart and the plants about 8 in. apart in the rows.

Good varieties of silver beet include Lucullus and Dark Green Broad Ribbed and of spinach beet, Perpetual Spinach Beet.



Roasting Meat

By MAUD B. STRAIN,
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MEAT is cooked to destroy possible disease-producing organisms and to increase its palatability. Cooking does not always increase the tenderness. Incorrect timing and temperatures can produce an entirely opposite effect and make the meat flavourless and indigestible. This article describes the method of roasting which has been found by experiment and experience to result in tender, juicy meat with the inside cooked to the right degree of "doneness" and the outside not hardened.

THE meat of any animal is largely made up of muscle tissue comprising bundles of muscle fibres. These are surrounded by connective tissue which attaches the fibres to one another. Each muscle fibre is a sort of tube that encloses a large part of the flavouring and food value of the muscle. Fat is intermingled with the muscle fibres and connective tissue. Meat well marbled with fat is usually more tender and better flavoured and the fat helps to retain the moisture in the meat during cooking.

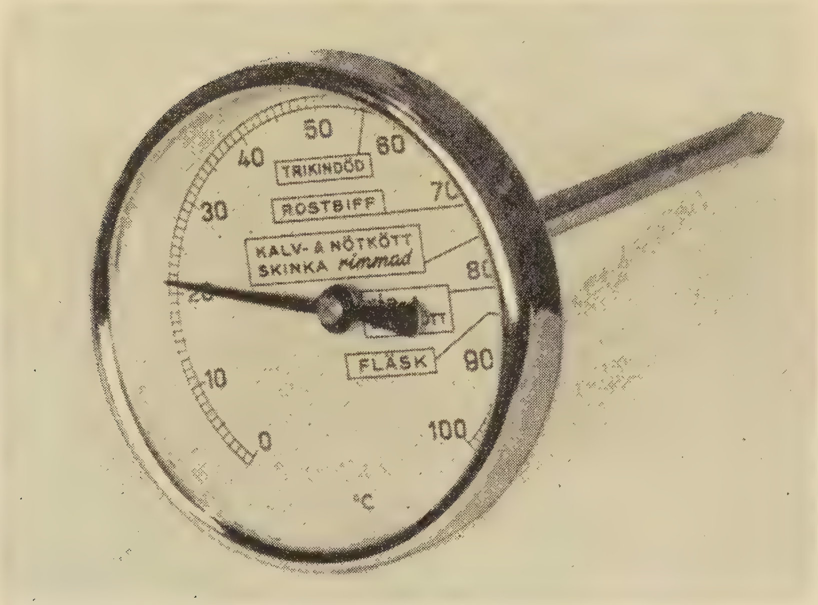
Changes during Cooking

When it is cooked the meat changes from red or pinkish grey to brown and it loses weight and shrinks. Water and other volatile substances evaporate from the surface, and fat, water, and extracts escape from it. Heat coagulates the proteins (as egg white sets when heated) and causes the muscle fibres to become firmer and shrink. If the temperature is too high, or the cooking period too long, the fibres become hard and dry.

The connective tissue is of two kinds; one is very elastic and tough and is unaffected by cooking, but the other is softened and changed to gelatine by the prolonged action of moist heat. The tenderness of cooked meat, therefore, depends on the composition of the meat and on the temperature and time of cooking.

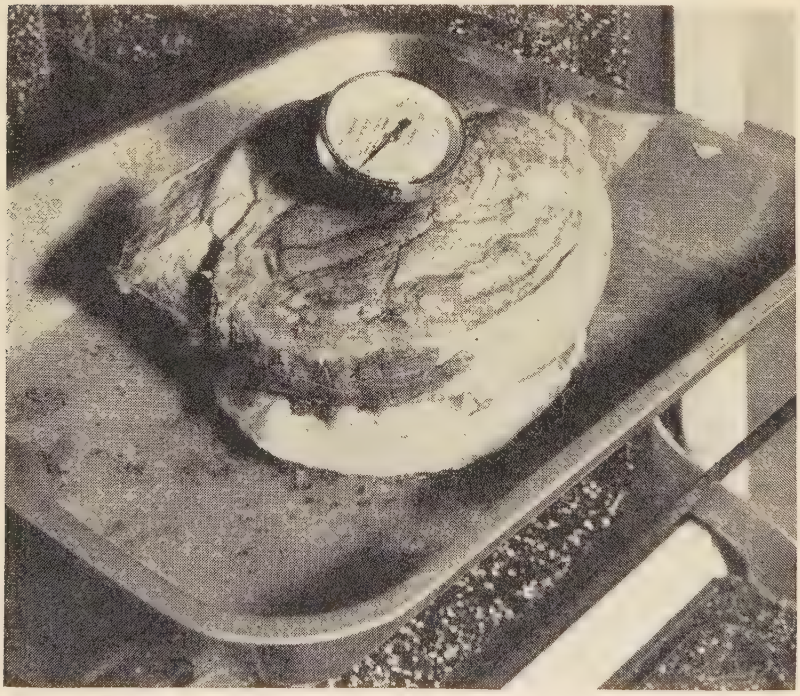
The palatability of the meat is increased by cooking because of changes in colour, flavour, aroma, and texture. The protein sets and some of the water is squeezed out, giving a firmer texture. The fat melts and some on the outside surface is browned, which develops flavour and aroma.

ROASTING MEAT



A Swedish meat thermometer. The degrees are marked in Centigrade and the correct "done" temperature for the various meats is indicated. The English equivalents of the Swedish terms are: Trikindod, sterilisation temperature for trichinae (parasites found in underdone pork and causing the disease trichinosis, prevalent in European countries, but as yet not found in New Zealand); rostbiff, roast beef; kalv- & notkott, veal and beef; skinka rimmad, cured ham; far- & lammkott (obscured), hogget and lamb; flask, pork.

▼ The meat thermometer is inserted in the middle of the thickest and most meaty part of the joint before it is put into the oven.



The method of cooking to be used for any cut depends on the part of the carcass it comes from. The less exercised muscles give tender meat, but the more exercised ones will have stronger muscle fibres and more developed connective tissue and will be less tender. Correct cooking should increase the tenderness of the less tender cuts and not toughen the tender ones. It should give juicy meat, the centre being cooked and the surface not hardened.

Methods of Cooking

There are two basic methods of cooking meat:

1. Dry heat, for example, roasting, grilling, and dry frying.
2. Moist heat, for example, braising, and cooking in liquid (stewing, boiling).

Frying (cooking in fat) is regarded as dry heat since no liquid is used.

Dry Heat

Roasting is cooking by hot air, as in an oven. Grilling is cooking by direct heat, as over hot coals, or under a gas flame or an electric unit.

Dry frying (pan broiling) is cooking by heat which is transmitted to the meat from the hot metal of the frying pan rather than by direct heat as in grilling, and the fat is poured off as it accumulates in the pan. Frying is done either in shallow fat, that is, in a small amount of fat, or in deep fat where the food is completely immersed.

Moist Heat

Braising means browning the meat in a small amount of fat, just sufficient to prevent it sticking to the pan, then covering it and cooking it slowly in its own juices or in a small amount of added liquid. Cooking in liquid, which is used both for stews and for boiling larger cuts, means cooking slowly in enough liquid to cover.

Oven Temperature

There is one rule of meat cookery that applies to all methods, and this rule cannot be given too much emphasis: **Always cook meat at a low temperature**. This is important for many reasons and should always be kept in mind. The value of the low-temperature rule has been proved repeatedly by carefully controlled meat cookery experiments. It is particularly well illustrated by the following results of experimental work in roasting.

Two roasts from the same animal, one from the right side and one from the left so that they would be as nearly identical as two roasts could be, were roasted, one at 300 degrees F and the other at 450 degrees F until they reached the same degree of doneness as recorded by meat thermometers. When put in the oven they each weighed 12¾ lb. When cooked the one done at 300 degrees F weighed 10¼ lb and the one done at 450 degrees F weighed only 8¼ lb. The low-temperature roast was juicy and uniformly cooked, while the high-temperature one was dark and charred.

Only a moderate amount of drippings escaped from the low-temperature roast which meant that plenty of good meat juice was still retained in the joint, while the loss in drippings in the high-temperature roast was much larger. The difference in drippings was not only in the amount, but also in the characteristics. Those from the low-temperature roast could be used to make delicious gravy, while the others were charred and dark and not desirable.

Experiments based on cooking meat by other methods comparing high temperatures with low temperatures all proved that there is less loss, more tender meat, and better flavour when meat is cooked at a low temperature.

Previously, roasted meats were always seared in a hot oven (about 500 degrees F) for 20 to 30 minutes, then cooked at 300 to 350 degrees F for the rest of the time. The searing caused the surface proteins to coagulate rapidly and form a layer which it was thought prevented the loss of juices and nutrients. Investigations have shown that instead of decreasing losses from the roast, searing increased them.

Searing is still done by many because they argue that the heat breaks down protein, and fats in the surface layer and so develops flavour and increased palatability. If this is the only reason for searing, why not do it at the end of the cooking time? The temperature can be raised to 450 degrees F for the last 15 to 20 minutes and this is useful when there are potatoes to brown or Yorkshire pudding to cook.

Internal Temperature

A more uniformly cooked joint is produced by cooking at a constant temperature, and the lower this constant temperature is, the more uniform will be the degree of doneness. Beef is cooked rare when it reaches an internal temperature of 127 to 147 degrees F, medium done at 150 to 165 degrees F, and well done at 165 to 180 degrees F. Lamb is medium done at about 170 degrees F, and well done at 180 degrees F. Veal and pork, which are always served well done, are thoroughly cooked at an internal temperature of 170 degrees F and 185 degrees F respectively. An oven temperature of 300 degrees F is sufficiently high for all except pork, which, because it takes longer to cook than other meats, is for convenience cooked at 350 degrees F.

Heat Penetration

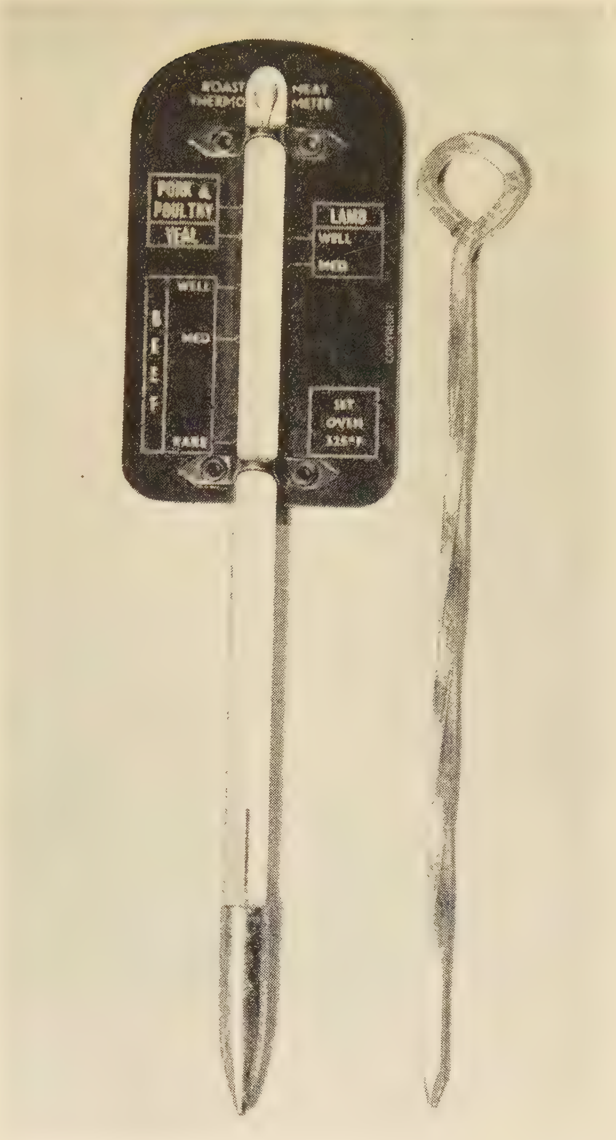
The size and shape of the joint, the amount of fat present, whether it is boned and rolled or still on the bone, all make a difference to the cooking time.

CUTS SUITABLE FOR ROASTING

Beef	Mutton, lamb, hogget	Pork	Veal
Rump	Leg	Chops	Fillets
Fillet or undercut	Loin	Loin	Steak
Sirloin	Shoulder	Crown roast	Cutlets
Prime ribs	Loin chops	Leg	Loin
Wing ribs	Rib chops	Shoulder	
Rolled ribs	Cutlets		

ROASTING TIMES

Meat		Oven temperature (degrees F)	Internal temperature (degrees F)	Approximate minutes per pound
Beef ..	Rare ..	300	140	18 to 20
	Medium ..	300	160	22 to 25
	Well done ..	300	170	27 to 30
Veal ..	Well done ..	300	170	25 to 30
Mutton ..	Well done ..	300	180	30 to 35
Lamb ..	Well done ..	300	180	30 to 35
Pork ..	Well done ..	350	185	35 to 45
Chicken ..	.. .. ..	300 to 325		45 to 55



[*Hurst and Palmer*

Meat thermometer with English graduations. The scale indicates the height to which the fluid in the bulb must rise before each type of meat is done. The tool is used for making a cut in which the bulb of the thermometer can be inserted. In this way it is possible to ensure that the bulb is in the correct place and not resting against bone.

A joint on the bone cooks in less time than it would if boned and rolled. A rib of beef on the bone cooked rare takes 18 to 20 minutes to the pound, but the same joint boned and rolled takes up to 30 minutes per pound for the same degree of doneness. A thick, chunky joint takes longer than a thin, broad one of similar weight. Meat which is well covered with fat cooks quickly.

Meat Thermometer

A meat thermometer is an aid in roasting because it is an accurate method of telling when the meat is cooked to the desired degree of doneness. It should be inserted so

ROASTING MEAT . . .

that the bulb of the thermometer is in the thickest part of the meat, and it must not rest on bone or in fat, as then it will give a false reading. A tool provided with the thermometer makes the incision and a scale attached to the thermometer indicates when the internal temperature has reached the desired level.

A timetable for roasting should be consulted for the approximate time the joint will take, so that this time can be correlated with those required for preparing and cooking other foods in the meal.

Frozen meat can be cooked in the same way as fresh meat if it is thawed out slowly before being placed in the oven. If it is put in the oven frozen, its cooking time is approximately doubled. Cooking losses are also greater than if it is first thawed.

Gravy

After the cooked roast has been removed most of the fat is poured from the pan, leaving sufficient for making the desired amount of gravy. There should be 1½ tablespoons of fat for each cup of gravy. Flour in the same proportion (1½ tablespoons to each cup) is sifted into the fat and browned in the pan. The brownings from the meat which also remain in the pan help to colour and flavour the gravy. Hot liquid is added gradually and stirred well to make the gravy smooth. The liquid can be boiling water, but vegetable stock is preferable because it adds flavour and makes use of the nutrients which escape from the vegetables during cooking.

The gravy should be boiled for a minute or two and seasoned, but remember, if vegetable water is used, it may already contain salt.

Stuffing

Stuffing gives variety, adds flavour, and acts as an extender. Boned joints may be stuffed or a stuffing may be made separately and cooked in the pan with the joint. In this case the stuffing needs to be basted frequently and it will absorb the flavour of the meat from the drippings.

The stuffing should be suited to the meat. If the meat has a delicate flavour, chicken, for example, the stuffing should not be so strongly flavoured as to mask the flavour of the meat. Meat with a well defined flavour of its own can be served with a more strongly flavoured stuffing. Meat, such as veal, which is lacking in flavour, needs a stuffing to provide flavour and make it more interesting.

The stuffing should not be packed in tightly; it needs room for expansion. The edges of the meat should be secured with skewers while cooking, but these are removed before serving. Sewing the edges of the meat is sometimes more satisfactory than using skewers, but the thread is removed before serving.

Rules for Roasting

Wipe the meat with a clean, damp cloth; tie and skewer if necessary.

Weigh the roast.

Season with salt and pepper.

Insert a meat thermometer, if available, in the centre of the thickest muscle.

Place the roast, on a rack if possible, in a roasting pan with the fat side up. The rack keeps the roast above the drippings and the fat bastes the meat.

Roast in a slow oven (300 to 350 degrees F) for the suggested number of minutes per pound or until the desired internal temperature is reached.

Remove the thermometer.

Serve the roast with gravy and suitable accompaniments.

Drip Stews are Easily Made

IN earlier days a great favourite with the housewife and the family alike was the drip stew, which could be left unattended for several hours. Now, however, it seems to have been almost forgotten with the advent of pressure cookers and automatic stoves, but for flavour and ease of preparation it is well worth making.

With this stew as a basis, and boiled potatoes and a quickly cooked green vegetable to go with it, a complete meal can be served less than half an hour after the housewife comes in from gardening or a day out, thus enabling her to make the most of the shorter daylight hours in winter and at the same time produce a meal to satisfy even the heartiest winter appetites.

Any man who has to cook for himself could use it frequently through the winter to save the worry of meal preparation at night when outside work is done, because it can be easily varied by adding different vegetables and seasonings and serving it with different accompaniments.

Flat-based Saucepan

It is necessary to have a large, flat-based saucepan with a **tightly fitting lid** and a basin which will fit into this saucepan leaving a space round the sides. The size of the saucepan and the basin will depend on the number of people to be cooked for and the length of time it is to be left unattended.

Cut the required amount of stewing steak into pieces sized according to the length of cooking time; for example, if it is to cook for 6 to 7 hours, the pieces should be fairly big, or if it will be cooking for only a morning or an afternoon, 1½ in. cubes would be suitable. Dip the meat in well seasoned flour and brown quickly on all sides in hot fat. Drain and place in the basin. If a thick gravy is preferred, add extra seasoned flour to the meat in the basin.

Root vegetables such as carrots, turnips, swedes, and onions, even potatoes if desired, cut in fairly big chunks, can be added at this stage. Alternatively they may be added more finely cut about an hour before the meal is to be served, if someone is on hand to do this at that time. Add salt and any other seasonings desired, but no liquid, and place the basin in the saucepan.

Fill the saucepan carefully with cold water almost to the level of the top of the basin, but not so full that when the water boils it will bubble over into the basin. Put on the lid and place the saucepan on a **low** heat where it can be left safely unattended for several hours.

Condensation of Steam

When the water boils, the steam, which cannot escape because of the tightly fitting lid, condenses on the inside of the lid and drips back down into the basin, where it mixes with the meat and flour to form a rich, well flavoured gravy in which the meat cooks very slowly to complete tenderness. Thus the need for the saucepan lid to fit very tightly is obvious.

The longer that the stew is to be left unattended the greater will be the amount of water necessary to prevent the saucepan's boiling dry.

The first time this stew is made it is advisable to keep a check on the water level and rate of cooking. This will enable any necessary adjustment to be made next time it is prepared. Then when the time comes to have a dish which will look after itself while the family is away for several hours, or even all day, it can be left to cook itself with no worry of anything untoward happening.

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Garden Walls

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HILL gardens have a natural charm, but work in them can be difficult. Terracing will make gardening easier and when walls are judiciously fitted into the landscape they can become a feature. Types of walls and their construction, merits, and faults are discussed in this article.

TERRACING by several small walls is usually the most desirable method in hill gardens because construction is easier and also the character of a hill garden is retained. A high wall is generally unattractive. Even if in time it can be covered with trailing plants, it does not provide scope for growing the mixture of plants which makes hill gardens so attractive.

Frosts are generally not the same problem in hill gardens as on flat sections, but frost danger is relatively less on a sloping section than it is on a terraced one. The wider a terrace the greater is the chance of it becoming a frost pocket and the nearer the bottom of the hill the greater this danger becomes.

Underground springs are often encountered where a large excavation is made for a wall and require adequate outlets, but where it is possible to break the hillside up with several smaller walls drainage can more readily be provided.

A series of smaller walls are much easier to make. Not only is the job simpler, but also it can be done over a period. Each wall can be made as time and finance permit and there is less interference with the general development of the garden.

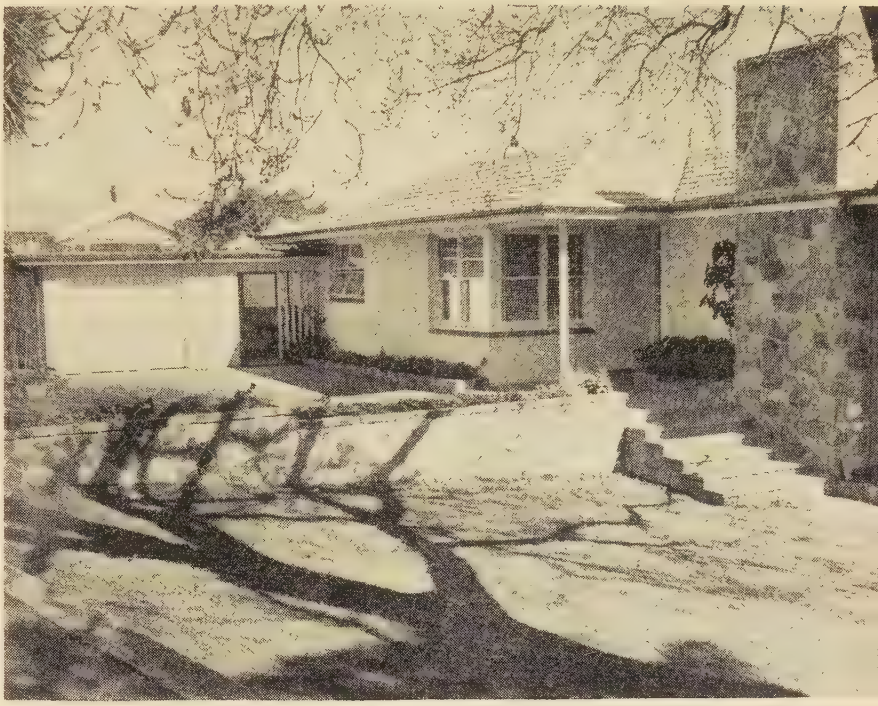
Walls should not be made too long. A garden will be more interesting if the terraces vary a little in levels and extent.

Terracing of a hill section done with the strength and enthusiasm of youth will make work in the garden so much easier in later years.

Foundations

It is of utmost importance to have a firm foundation to a wall. This is seldom difficult on a slope, as the subsoil is mostly hard clay, rock, or papa, but not so where a hillside has been levelled before building was started and considerable quantities of loose soil have been thrown down the slope.

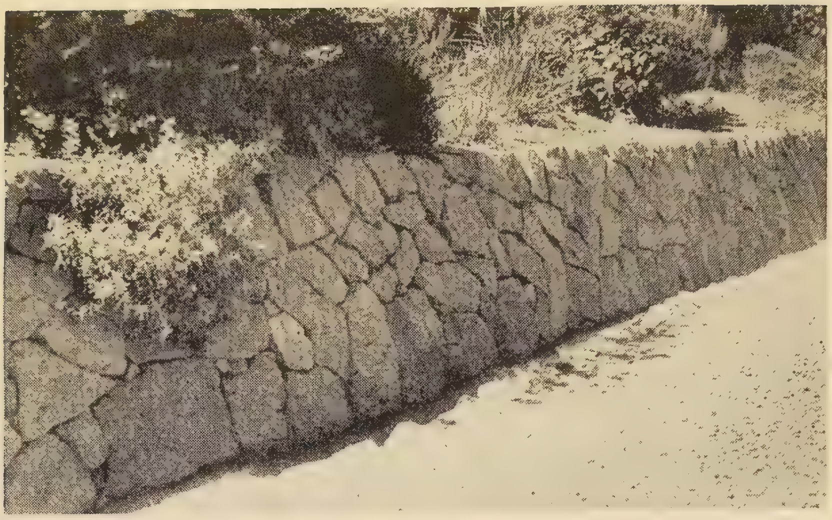
With such unstable soil it is risky to build permanent walls, and, in general, it would be wiser for an amateur to build a temporary wall until the soil has settled.



[Sparrow

The stone wall and steps with matching chimney distinguish the approach to this house.

▼ Concrete walls are very formal and give a cold atmosphere to a garden.



[V. C. Browne

A well made dry wall. Note how each piece of stone has been fitted into position.

▼ When concrete walls are heavily clothed with trailing plants they fit into the garden scene much better.

Drainage

Drainage must be efficient, as water can weaken the foundation and it is better to be over-generous when making drainage holes than to make too few. It is preferable to place them at different levels along the wall with adequate drainage at the foot of the wall.

Drainage holes can easily be made in concrete or mortar walls by inserting round bottles during the construction. If they are given a slight turn occasionally while the concrete or mortar is hardening, they can be pulled out afterward.

It may be necessary to provide a drain at the foot of the wall and the flow will determine the size that is needed.

Concrete Walls

Concrete walls are the easiest to make, but reinforcing is necessary if there is much height or stress from the soil behind.

Where a low wall can be placed on a firm foundation and where there is no risk of movement of the soil behind, an ordinary concrete wall will generally suffice.

Details on construction and materials for concrete and mortar are given in the Department of Agriculture Bulletin No. 345, "Concrete", available free from the nearest office of the Department.

Though concrete walls are durable and easy to construct, they cannot be fully recommended. An occasional concrete wall may look neat, but a series of them tends to give the garden a cold atmosphere. Their outline is hard and they do not mellow and blend into the surroundings as do stone or brick walls.

Stone Walls

Stone walls can be made just as durable as concrete walls; in fact, a stone wall is often faced only and concrete poured in behind to strengthen it. They are, however, much more informal and pleasing than plain concrete walls.

Sea or river boulders or rocks dug out of the ground can be used, but split quarry stone is much easier to work with. Such stones generally have one flat surface, which can be used for facing, and their irregularity facilitates placing.

A stone wall should preferably be embedded in a concrete foundation and a batter, or backward slope, of at least 1½ in. per foot of height should be given.

Placing of the stones is simplified if a fairly "fat" mortar of lime, cement, and sand is used. No empty pockets should be left and the mortar should be worked well in between the stones. The face of the wall should be finished neatly, or the crevices between the stones can be pointed.

The back does not have to be finished off as carefully, especially if concrete is to be poured behind. If this is not done, mortar should be used at the back to strengthen the wall and a long stone pointing into the terrace should be placed occasionally to tie the wall into position. The soil should be well filled in below these ties to ensure that they are kept stable while the mortar is drying.

Split stone can also be used for steps and paths and if that is intended, the stones should be sorted while they are being used to save chipping them into shape.

Buttresses in stone walls are not necessary, as the stone should have enough character to make it interesting, and if strengthening is required, it can be given inconspicuously at the back of the wall.

Concrete Block Walls

Concrete blocks can also be used for garden walls and various types are now available.

If the blocks are used to make a close wall, with the blocks mortared together, the result is more pleasing than a plain concrete wall, though still very formal.

Block walls must be made more carefully than stone walls, as the slightest irregularity will be noticed, but the blocks are easier to line up than uneven stone.

Hollow blocks have the advantage that if they are placed correctly on top of each other, reinforcing rods can be inserted after the wall has been built and concrete poured in to finish the job.

Blocks can also be used for making a "dry wall", described later, when their uniformity of size and shape enables their placing to be more secure than uneven stone.

Brick Walls

Though brick walls are formal, they fit into the garden much better than concrete walls. They should be well made and if strength is required, this can be provided by buttresses, which do not look out of place in this type of construction.

Brick walls can be made in pattern in the same way as concrete blocks; any change from the normal will make the wall more interesting.

If steps are made between the terraces, they will look more attractive if made in brick also.

Timber Walls

Wooden walls are more temporary than the others dealt with, but if soundly made will last for some years.

Both sawn and rough logs may be used. Preserving treatment will prove well worth while before their use.

The timber is generally placed horizontally in even lengths, being joined behind the posts.

Placing of the posts is most important. They must be strong and set deep enough to hold the weight of the soil pressing against the wall. A batter of 3 in. per foot of height will ease the strain on the posts.

Timber walls can often be made cheaply after completion of a concrete dwelling, as the boxing can be used.

An advantage is that drainage will be better provided for than in a solid wall.

Corrugated Iron Walls

Second-hand corrugated iron can be used for walls in the same way as timber. More supporting posts, however, should be used, as iron sheets may bend in the centre under pressure and if that happens, it is a major job to get them back in position again.

The iron should be treated before use with a rust killing preparation. Bituminous roof paints are excellent and provide a good seal on the side into the soil.

Timber and iron walls are temporary only.

On this wall of stone slabs a few trailing plants make it interesting without altering its character.

Dry Walls

Dry walls are made of stones packed with soil and no cement or mortar is used to bind them. Concrete blocks are now also used for this type of wall, but as the effect in the garden and method of use are quite different, they are dealt with separately.

Dry walls of stone are satisfactory only for low walls. In most places they are very expensive to erect, as a great many stones of good quality are required. The only justification for this type of wall is that it is possible to plant between the stones, but maintenance costs today are so high that they are seldom built.

As with other permanent walls the foundations must be solid and drainage must not be able to weaken it. A tile drain may therefore be needed on the back of a wall to take away any seepage which may come down through the naturally sloping subsoil. Its unstable nature makes it much more prone to collapse under pressure than a solid wall.

The stones should be fairly large and rough to ensure a good grip. Quarried and split stones are the best, but even then it may be necessary to shape them to make them fit firmly. River and beach stones are generally not suitable, as their smoothness prevents them from being placed securely.

A batter of 3 in. per foot of height should be given and the largest stones should be used at the bottom of the wall. Each stone should be laid so that any movement is backward, where the soil will prevent it from slipping, but, generally, movement should be prevented by a firm packing of soil and smaller stones.

Good garden soil should be used in the wall to sustain the plants grown in it. It is possible to plant while the wall is being constructed and the roots can then be spread out in the soil between the stones, but of course, it must be the right season.

The stones on top should be as securely fitted as the others and large enough that they cannot be dislodged by children.

It is much simpler to construct a wall of concrete blocks, or evenly shaped stone because the blocks or evenly shaped stone can be placed firmly on each other, the joining surfaces can be reduced and a patterned interval allowed. This reduces the weight of a wall and gives greater flexibility. Block walls, or crib walls, can therefore be built higher than other types of wall without reinforcing. Proof of their strength is that such walls are used in road construction, where safety is of paramount importance.

Construction of a very open crib wall is illustrated. Crib walls are sometimes attempted in brick, but the weight and size of the bricks are not enough to anchor them securely.

Providing Plant Cover

No matter how attractive a wall may be in itself, its appearance will be improved when the outline has been softened with plants. They can be used trailing from the top as well as growing at the base. Dry walls, of course, provide much greater scope, as plants can be rooted between the stones. However, there is a danger that perennial weeds may be intro-

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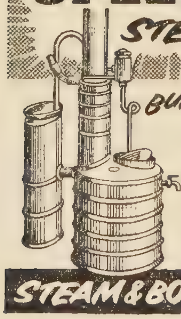

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duced and they are almost impossible to eradicate without using chemical weedkillers.

Fairly full cover can be recommended for plain concrete walls, and vigorous trailers such as aubrietia, morning glory (*Ipomaea leari*), arctotis, and *Dimorphotheca ecklonis* are suitable.

Stone and brick walls should be partly covered only and sprawling plants of compact habit are more suitable and can be used with the less vigorous trailers, such as alpine dianthus, *Campanula* sp., *Sedum* sp., *Mesembryanthemum* sp., *Alyssum saxatile*, gazania, and the trailing rosemary.

Further information on the layout of hill gardens and suitable plants is provided in the February 1959 issue of "The Journal".

Work for September

September is a busy but interesting month in the flower garden, as many different plants are beginning a new season's growth cycle. This is most marked in the colder areas, where the dormant season is more definite and spring blossoms are even more welcome. Because of the warmer and earlier spring in northern districts sowing and planting of summer flowering plants can begin earlier.

What to do with Seeds

With a little care several packets of seeds of annuals can give a most effective display over a long period in summer at little cost. If there is a suitable warm and sheltered position in the garden, the top 6 in. of soil could be enriched with sieved compost and lightened with sand if necessary before the application of fertilisers and the sowing of seed.

Such a position is, however, often the treasured place for spring flowering plants and for this reason and also the fact that seedlings are not so easily lost when in boxes, it is generally recommended that seed be sown in boxes which are 2 to 4 in. deep.

The boxes should be cleaned and sterilised by watering with 1 part of formalin in 49 parts of water. A layer of coarse rubble, leafmould, or coarse sievings from the compost heap can be placed in the bottom to assist drainage.

By ROSALIE A. CAMPION,
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When making a mixture in which to sow seed it is not so important to follow a recipe as to achieve a mixture which is quite open and yet has some body. Loam gives body and supplies small quantities of nutrients. Organic matter also gives body and helps retain the moisture and added nutrients. A guide for the making of such a mixture is:

2 parts of sieved fibrous loam
2 parts of sieved leafmould, peat, or compost
1 part of coarse sharp sand
plus
1½ oz of superphosphate and
¾ oz of garden lime per bushel of mixture (about an apple box).

All ingredients should pass through ⅛ in. sieve. When sowing in the open ground twice this quantity of superphosphate and lime should be used per square yard. Boxes should be filled level with the mixture, the soil should be consolidated with the fingers, especially at the sides and corners, and then smoothed and firmly levelled with a float (flat piece of board).

The seed should be dusted with thiram, sown thinly, and pressed into the seedbed with the float before it is lightly covered with sieved mixture. The box should then be placed in 2 in. of water (a washtub is suitable) and left until moisture shows in one or two places on the surface. The box should then be removed, covered with glass and then newspaper, and placed in a warm place in no danger of drips from the roof. When seedlings begin to show the paper should be removed and two days later the glass can be removed.

What Seeds to Sow

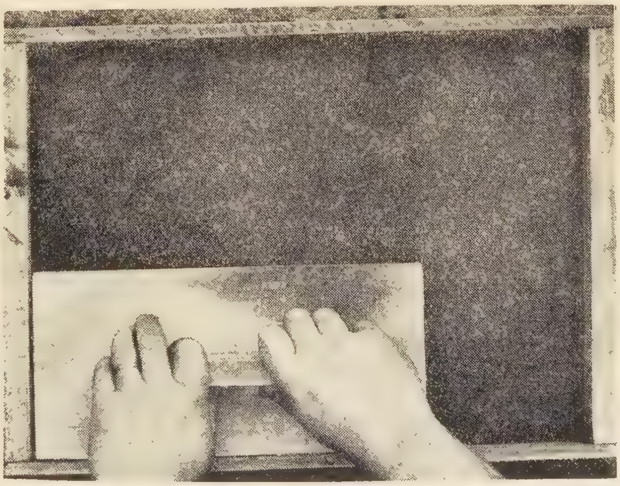
Under glasshouse conditions the above method can be used for seeds which require warm conditions for germination. Outdoors, hardy plants which are to be transplanted, can be sown in boxes, while hardy plants and those which develop best when sown where they are to flower can be sown in the open. Of this latter group, linum, viscaria, mignonette, and love-in-the-mist are useful for sowing in pockets among permanent plantings to give an added splash of colour and interest.

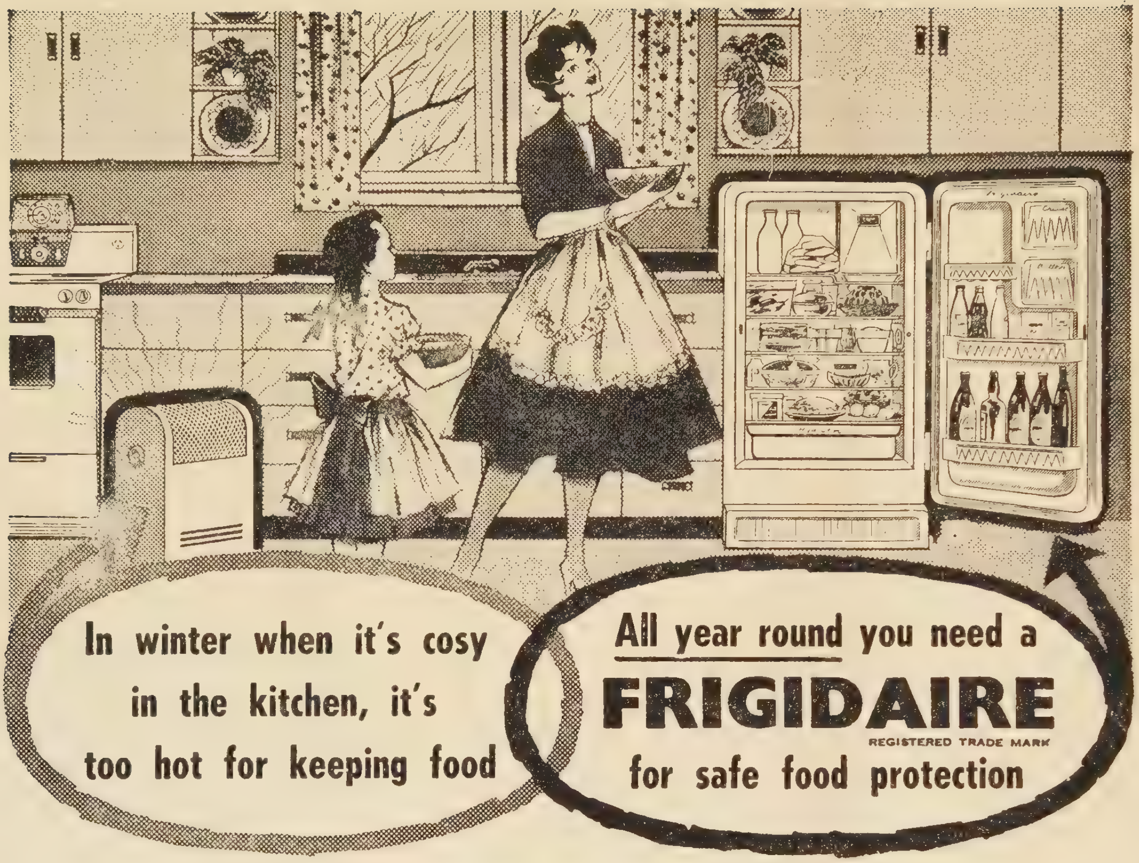
When the Seeds are up

Seed sown previously may now be up and should be given frequent atten-

▼ Bottom of seedbox lined with sievings of compost to assist drainage.

▼ Firming the newly sown seed into the box with a float.

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tion. It is usually better to water seedboxes by soaking in water than by sprinkling, which may create humid conditions conducive to trouble from the damping-off fungi.

As soon as seedlings have their first pair of true leaves they can be pricked out 2½ in. apart each way into a mixture with more body and more fertilisers.

Plants being hardened off in frames should have the lights lifted when possible. It has been found that polythene is a doubtful replacement for glass on frames, as it allows quick escape in the night of heat built up during the day. This deprives plants of the protection they still need.

Pansies and violas could be planted out now and make attractive borders round permanent beds of roses or fuchsias.

Bulbs Need Attention

Many spring bulbs are now past their best and the tops can be neatly tied in knots so that they continue to feed the bulb. DDT round the base of the plants will help prevent damage by narcissus bulb flies. New bulbs should be ordered while the varieties are still in flower. It is preferable to visit a good grower and see the varieties under field conditions rather than to order purely from the show bench. Tulips which have been attacked by virus should be dug up and burnt.

Summer and autumn flowering bulbs and roots such as cannas, agapanthus, galtonia, and acidanthera can now be planted. *Gladiolus nanus* (vars. "Colvilii" and "The Bride") should be planted by now and a few of the large gladiolus can be planted successively to give a continuing display from Christmas on.

Plants in the Border

Division and replanting of herbaceous perennials should be attended to urgently, as they are now starting into growth. Catmint, useful as a border and along driveways, can now be cut back and divided up if the clumps are too large or if required for extension. Gerberas can be broken apart now and planted in warm, sunny locations. The crown of the plants should sit above the soil when planted.

Lily-of-the-valley and other plants nearing flowering will benefit from applications of weak liquid fertilisers. The whole flower border should now be given a dressing at 4 oz per square yard of balanced fertiliser made by mixing

3 parts of blood and bone
2 parts of superphosphate
1 part of sulphate of potash

Cuttings of agathea, marguerite, hybrid wallflower, centaurea, and violet can be placed in sandy mixtures in a frame to root.

Chrysanthemums and Dahlias

If the planting positions of chrysanthemums and dahlias are alternated, the build up of plant diseases which attack each crop is not so great. Both plants are gross feeders and repay all efforts to incorporate farmyard manure, compost, seaweed, and similar materials as well as regular balanced chemical feeding. Lime at 2 oz per square yard could also be given now.

Three-inch cuttings from the tips of chrysanthemum shoots should be neatly trimmed and placed in a box of a sandy mixture to root. In cooler districts they could be placed in a cold frame, but in the warmer areas they can be set outdoors. A sheet of paper should be placed over the box to stop the cuttings from flagging. Cuttings rooted in this manner will give shorter plants of bushier growth than those grown from rooted slips.

Cape Tulip

Cape tulip (*Homeria collina*), in flower this month, appears to be grown in many gardens in New Zealand. All parts of this bulbous plant are poisonous and it should be destroyed.

The flowers may be salmon with a lemon centre or pure lemon. They open consecutively up the 3 ft stem. The bulbs are up to 1½ in. wide and covered with a mesh of fibre. The plant typically has only one leaf per bulb. This leaf is straplike and may be up to 3 ft long.

The whole plant should be lifted and burnt. Well established plants are very difficult to remove completely, as the young bulbs are very small. The place where the plants were removed from should be left vacant for at least two years, as some of the bulbs may remain dormant for a season, and grow the next.

A spray of 2,4-D plus diesel fuel is recommended for heavy infestations where it is possible to use this without damaging other plants.

Dahlias can be encouraged, in frost-free positions, to send up new shoots. The tubers can later be divided or the shoots removed and set in a warm position to develop roots.

Eelworms

Eelworms cause sections of chrysanthemum leaves to turn dark brown and the leaves to shrivel and hang down. The damage usually starts at the base and extends upward until finally the whole stem is defoliated. Many spring flowering bulbs are also damaged, the attacks causing blister-like swelling of the foliage and distortion and yellowing of the flower stem and foliage. In New Zealand eelworms are also known to attack delphiniums and scabious. Eelworms are very specific in their host range and some types of eelworm will attack only one type of plant.

For home gardeners the only possible method of control is the treatment of plants with hot water. This has to be done very carefully. Overseas work has shown that the growing roots of French and African marigolds give off a substance which will reduce the numbers of some types of eelworms. It may be worth while to plant this easily grown crop in infected soils.

Grassed Areas

Sowing of new lawns and topdressing of bare patches should be attended to as soon as possible. Grass grub has been so bad each year that the recommendation for their control is repeated this month, which is a suitable time to treat the ground before the grubs pupate. It is easiest to apply the DDT when mixed with the spring fertiliser application of

30 oz of sulphate of ammonia
10 oz of superphosphate
1 oz of 50 per cent DDT to 40 square yards of lawn

DDT should be applied to the flower and vegetable gardens as well, if grass grubs are a problem in the district.

One of the worst grass weeds which appears in garden areas is an annual, *Poa annua*. It flowers and seeds while the plant is very young and small and consequently the mower does not remove the seed heads. There may be several crops of this pale green grass each season, mostly during winter. It can cover gravel paths and bare lawns for several months during winter and spring, but dies out to leave bare patches on the lawns during summer.

The presence of this weed does not indicate that the soil is either too acid or too alkaline, as the grass will grow under either condition where the fertility of the soil is low. On lawns the fertility can be raised by the regular application of the fertilisers mentioned at least twice each year in spring and summer. It is preferable to apply them every three months.

On paths an application of dalapon at 1 oz to 120 square yards could be used to destroy *Poa annua*.

Hedge Plants

Several ornamental plants such as escallonia and *Chaenomeles japonica* (japonica) are now being used as hedge plants and should be clipped back after flowering. Privet, lonicera, macrocarpa, and euonymus should also be pruned at this time. Hedges of *Shawia paniculata* (golden akeake) are sometimes disfigured by the olearia gall midge, which causes stunting, rosetting, and malformation of the leaves. Plants are best trimmed back during winter and sprayed now with nicotine sulphate or DDT emulsion.

Phebalium hedges have often been damaged by boring insects and where boring holes are noticed in these and any other trees, petrol could be squirted into the holes before they are sealed with clay or plugged with a twig. Phebalium is also susceptible to attack by root-rotting fungi, especially where conditions are inclined to be damp. The trees should be planted only where drainage is excellent. If the hedge starts to die out for no visible reason in one area, it may be possible to restrict the damage to that area by drenching the soil with 6 oz of copper oxychloride in 3 gallons of water per square yard. *Lonicera nitida* and many other plants are also susceptible to this trouble.

Climbing Plants

Evergreen climbers including the climbing potato vine *Solanum jasminoides*, ficus, and ivy can be pruned back into position now. All climbing plants thrive best where there is adequate support. Plastic covered flex can be used to construct a cheap and artistic support which will not rust.

In new gardens use should be made of annual climbing plants such as *Mina lobata*, tropaeolum (canary creeper), sweet peas, and ipomea (morning glory) to give quick coverage of bare walls and early interest in the garden.

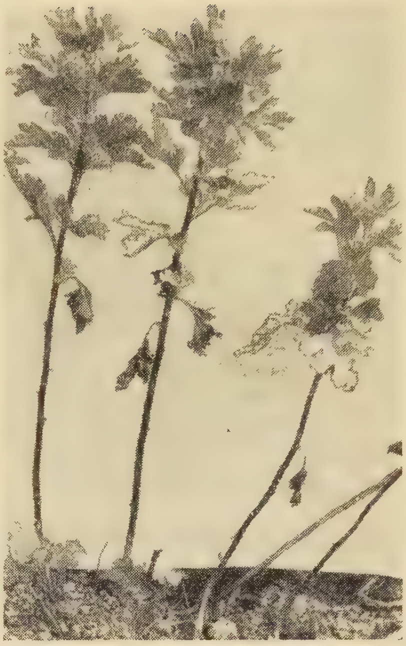
Shrubbery

Subtropical or tender plants and evergreens which would receive too much shock if planted out in the coldest months can now be planted. All shrubs should be lightly forked round and given a dressing of a balanced fertiliser such as that suggested for use on the flower border.

Native trees can now be lightly pruned to retain their shape. When flowering is finished prunus, kerria, diosma, waratah, coleonema, tamarix, lilac, and spartium can be pruned. The waratahs should be sprayed with malathion or summer oil to prevent a build-up of scale insects. In windy places the young shoots from the base of this plant should be staked. Boronia plants are naturally short lived, but premature death can often be avoided if the plants are sprayed with malathion or DDT emulsion to kill the insects on whose excreta a black sooty mould appears.

Fireblight

Fireblight has caused damage in many areas throughout the country in the past season. This bacterial disease attacks a number of plants in the Rosaceae family including cotoneaster, pyracantha, flowering apples, rowan, and hawthorn, as well as fruiting apples, pears, and quinces. Bees and other insects usually spread the disease from old infected wood when the flowers are in bloom.


[*Photo News*

An old clump of chrysanthemums severely infested with eelworm. The lower leaves have fallen and the stems are hard and woody.

The first symptom is a darkening of the flowers and young twigs which typically turn brown and remain attached to the stem. As the disease is also spread by rain splash and winter pruning, the removal of any diseased wood or general pruning on these plants should be undertaken now during dry weather. Expensive sprays of streptomycin have been used with some success during the blossom period to prevent spread of the disease.

Rhododendrons and Azaleas

Rhododendrons and azaleas may still be selected while in bloom in the shops and planted out. They require shelter from strong winds and prefer light shade for part of the day. After planting, a mulch of sawdust, to which sulphate of ammonia or blood and bone has been added, should be applied. In the early stages of the life of these plants, and especially with *R. fragrantissimum* and *R. indicum*, the young shoots should be nipped back often during the growing season to encourage a bushier habit.

The foliage of the evergreen azaleas is sometimes infected by a fungous disease, azalea leaf gall. Affected leaves look blistered at this season. They should be picked off and the plants sprayed with a copper fungicide.

Several leaf spots occur on rhododendrons, especially when growing under adverse conditions. Spotted leaves should be removed, conditions improved, and the plant sprayed with a fungicide such as thiram.

Under Glass

Plants which remain in the same pot for several years should be overhauled now. Those requiring repotting should be tipped out of old pots, the loose soil removed from the root area, and the roots lightly pruned before repotting. The top growth should be reduced to correspond with the root pruning. The surface of the pots of plants not being repotted should be scarified to remove moss and lighten the soil and then top-dressed with a good soil mixture. The dead bark should be picked off fuchsias and a malathion spray applied if mealy bugs are present. All old pots should be scrubbed clean and dipped in a very weak bluestone mixture to prevent growth of algae.

Begonia and gloxinia tubers being started into growth should be dusted with sulphur to combat mites, which have given considerable trouble in the last few years. Their starting media should be kept only slightly moist.

Seed of glasshouse plants such as begonia, streptocarpus, coleus, and gloxinia can now be sown.

General

Cyclamen flowers should be removed to prolong flowering. Cuttings of *Abutilon megapotamicum*, tradescantia, double lobelia, and coleus can be rooted for growing indoors.

Under cloches seed of asters can be sown direct into the ground. The plants grown this way are not so predisposed to the wilt fungus as those which are transplanted. Old plants of fibrous begonia can be broken up and planted out under cloches. These usually make taller plants than young seedlings.

Water lilies can now be lifted and divided if necessary.

Rose pruning should be finished immediately. The plants should be sprayed regularly against mildew, aphids, and caterpillars. A suitable combination spray can be made using

1 oz of 50 per cent captan or thiram
¾ oz of 75 per cent colloidal sulphur wettable powder
¾ oz of malathion powder
4 gallons of water

Many plants such as magnolias and rhododendrons can be layered now into the soil or into sphagnum moss in a polythene sleeve.

The dead and dying leaves of *Iris unguicularis* (stylosa) can be removed to tidy up the plants.

Hemerocallis will benefit from the addition of fertilisers and compost as growth starts.

Small Boy's Cardigan

THE small boy's 3-ply cardigan, illustrated at right, is both attractive and serviceable. The pussy-cat pockets add a touch of colour and will please many a small boy. Instructions for knitting are given below.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); inc., increase; dec., decrease; rep., repeat; tog., together; cont., continue; beg., beginning; in., inch(es); st.st., stocking stitch (1 row k., 1 row p.); Bl., blue; Bk., black; Yw., yellow; rem., remain(ing); sl., slip; p.s.s.o., pass slipped stitch over.

Measurements: Length 15 in.; chest 25 in.-26 in.; sleeve seam 11 in.

Materials: 4 oz of blue 3-ply; 1 oz of yellow 3-ply; ½ oz of black 3-ply; small ball of red; 2 No. 10 and 2 No. 12 knitting needles; 2 short No. 12 knitting needles (for front borders); 5 buttons.

Tension: On No. 10 needles, 7½ st. to 1 in.

Right Front

With Yw. wool and No. 12 needles cast on 58 st. Work 1 row in k. 1, p. 1 rib.

Break off Yw. wool, join in Bl. and p. 1 row. Now cont. in rib for ½ in. ending with a row on wrong side at front edge.

Next row: Rib 4, cast off 3 st. for a buttonhole, rib to end.

Next row: Rib to last 4 st., cast on 3, rib 4.

Remember to make 4 more buttonholes at 1½ in. intervals.

Cont. in rib until work measures 1 in., ending front edge.

Change to No. 10 needles and cont. in st.st. with ribbed front border on No. 12 needles, thus:

Next row: With short No. 12 needle rib 10, with No. 10 needle, k. to end.

Next row: With No. 10 needle p. to last 10 st., with short No. 12 needle, rib 10.

Cont. in this way until work measures 7 in., ending at front edge.

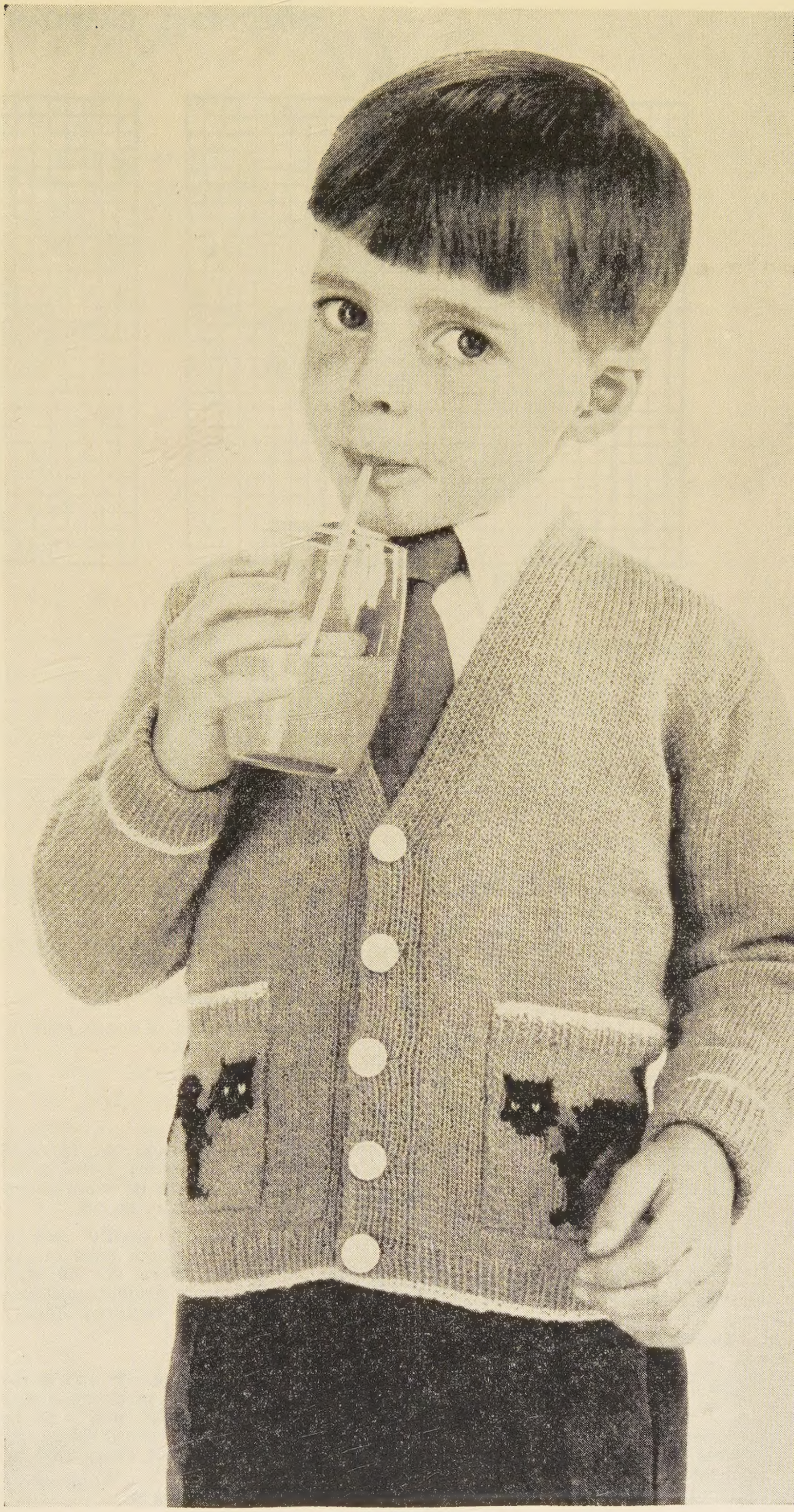
Five buttonholes should now be completed.

To Shape Front

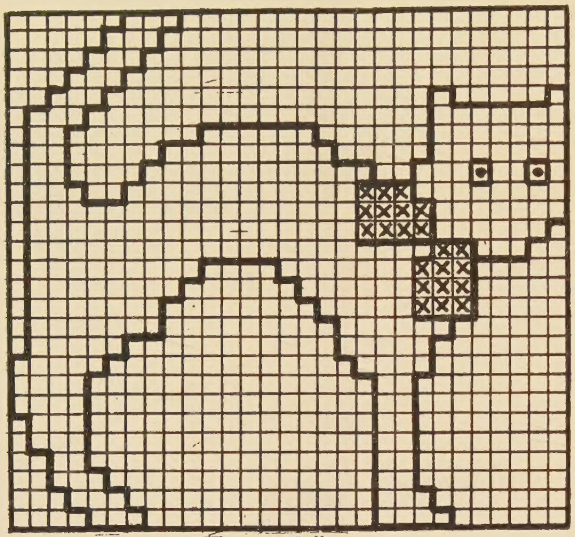
Next row: Rib 10 (No. 12 needle), with No. 10 needle sl. 1, k. 1, p.s.s.o., k. to end.

Work 5 rows without shaping.

Cont. in this way, dec. at front edge on next and every 6th row until work measures 9½ in., ending side edge.

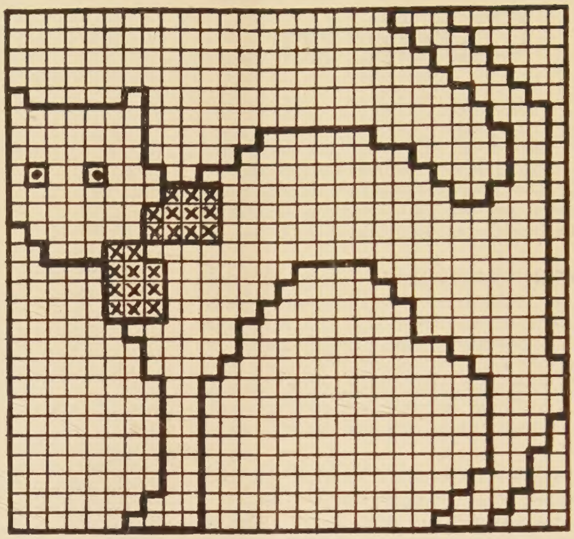


Right Pocket



X = Red ⊡ = Yellow

Left Pocket



To Shape Armhole

Still dec. as before at front edge, cast off 4 st. at beg. of next row, then dec. 1 st. at this same edge on next 7 rows. Cont. with armhole edge straight, dec. as before at front edge until 32 st. rem., then cont. without shaping until work measures 15 in., ending at armhole edge.

To Shape Shoulder

Next row: Cast off 7 st., work to end.
Next row: Work to end.
Rep. last 2 rows once.
Next row: Cast off 8 st., rib to end.
Work 1¾ in. in rib on these 10 st.
Cast off in rib.

Left Front

Work 1 in. of rib as for right front, omitting buttonhole and ending with row on wrong side at side edge.

Cont. in st.st. with reversed front border on No. 12 needles thus:

Next row: With No. 10 needle k. to last 10 st., with a short No. 12 needle rib to end.

Next row: With a short No. 12 needle rib 10, with No. 10 needle p. to end.

Cont. in this way until work measures 7 in., ending side edge.

To Shape Front

Next row: K. to last 12 st., k. 2 tog., rib 10.

Work 5 rows without shaping.

Cont. in this way until work measures 9½ in., ending side edge. Shape armhole and shoulder and complete front border as for Right Front.

Back

With Yw. wool and No. 12 needles cast on 92 st. and work 1 row in k. 1, p. 1 rib. Change to Bl. and p. 1 row.

Cont. in rib until work measures 1 in., ending row on wrong side.

Change to No. 10 needles and work in st.st. until back measures 9½ in., ending p. row.

To Shape Armholes

Cast off 4 st. at beg. of next 2 rows, then dec. 1 st. both ends of next 7 rows.

Cont. on 70 st. until work measures 15 in., ending p. row.

To Shape Shoulders

Cast off 7 st. beg. of next 4 rows, 8 st. beg. of next 2 rows.

Cast off remaining st.

Sleeves

With Yw. wool and No. 12 needles cast on 48 st. and work 1 row in k. 1, p. 1 rib. Change to Bl. wool and p. 1 row, then work 2 in. in rib.

Change to No. 10 needles and cont. in st.st. inc. 1 st. both ends of every 6th row until there are 70 st. on needle, then work straight until sleeve measures 11 in. or required length.

To Shape Top

Cast off 2 st. beg. of next 2 rows, dec. 1 st. both ends of every alternate row until 50 st. rem., dec. 1 st. both ends of every row until 30 st. rem., cast off 3 st. beg. of every row until 18 st. rem.

Cast off remaining st.

Pockets

Right Front

With No. 10 needles and Bl. wool cast on 33 st. Work 2 rows st.st. Cont. in st.st. working cat motif from chart on centre 29 st. thus:

Next row: K. 2 Bl., work from chart thus: K. 6 Bl., 4 Bk., 12 Bl., 3 Bk., 4 Bl. k. 2 Bl.

Next row: P. 2 Bl., work 2nd row of chart: P. 3 Bl., 3 Bk., 13 Bl., 3 Bk., 7 Bl., p. 2 Bl.

Cont. in this way, keeping the 2 extra st. up each side until the 27 rows of chart are completed.

Now using Bl. wool work 3 rows in st.st., then work 4 rows in k. 1, p. 1 rib.

Change to Yw. wool and k. 1 row, then work 1 row in k. 1, p. 1 rib.

Cast off in rib.

Left Front

Work exactly as given for right front pocket but work from chart for left front.

To Make up

Press work lightly on wrong side with hot iron and damp cloth. Sew pockets into position on each front with lower edge of pocket about ½ in. up from top of ribbed waist and 1 in. in from ribbed front borders. Join side, shoulder, and sleeve seams. Sew sleeves into armholes, matching the seams. Join front borders neatly and sew this strip along back of neck edge. Sew on buttons to match with buttonholes. Press seams.

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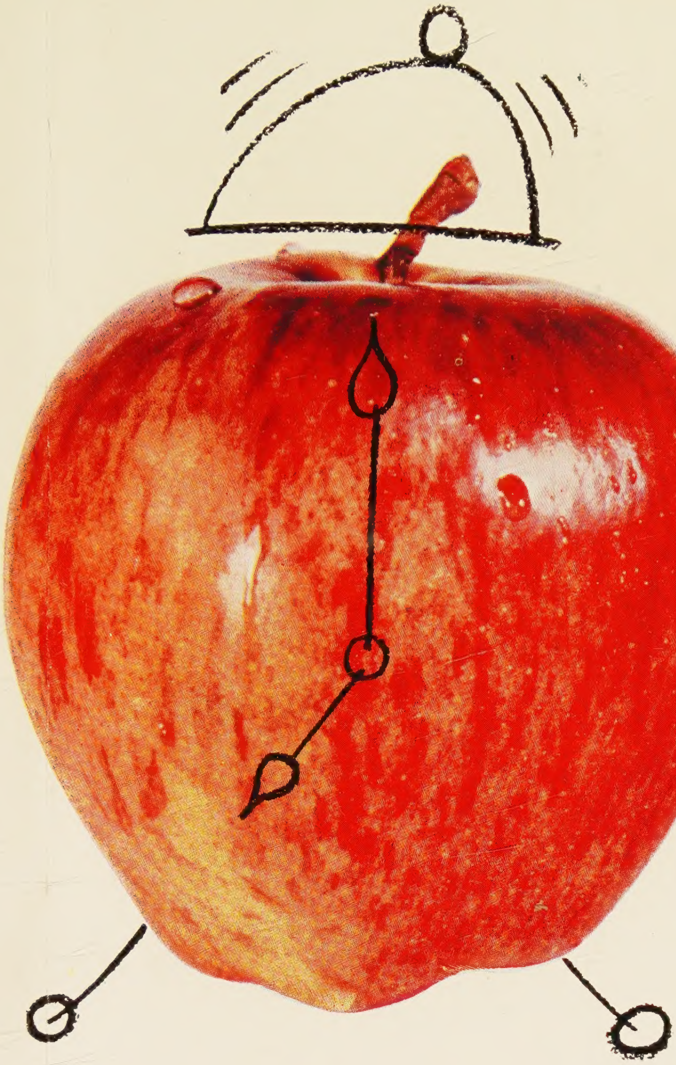

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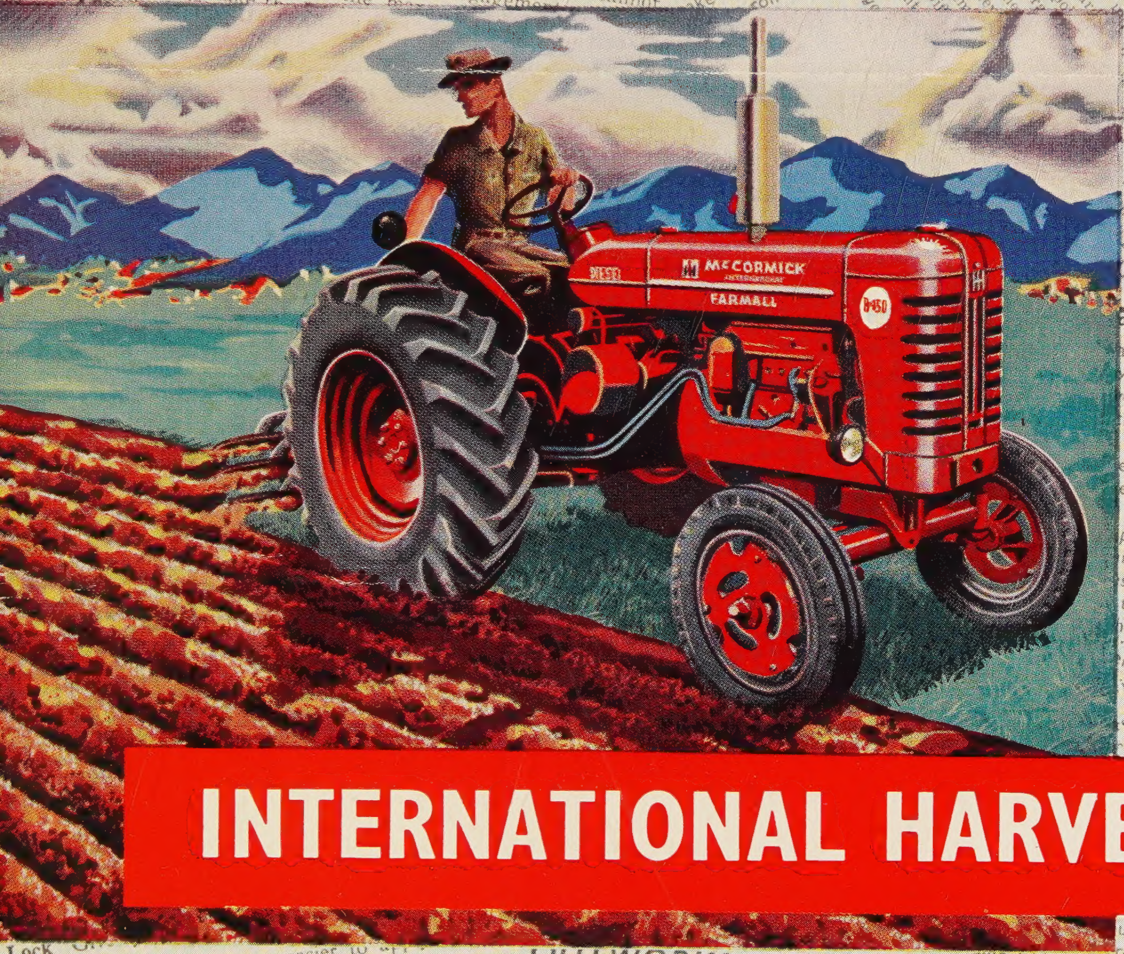

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